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# LINNÆUS AND JUSSIEU;

OR, THE

# RISE AND PROGRESS

OF

# SYSTEMATIC BOTANY

A POPULAR BIOGRAPHY, WITH AN
HISTORICAL INTRODUCTION
AND SEQUEL.

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# PREFACE.

ONE of the most useful and pleasing forms under which knowledge can be presented to the general reader is that of the biography of distinguished men who have contributed to the progress of that knowledge in some one or other of its various departments. But it too frequently happens that the biographical notices of great men consist rather of personal, trivial, and unimportant details, than of a clear and broad outline of the influence which they exerted upon the pursuit and upon the age in which they were distinguished. The true object of biography is, in tracing the progress of an individual, to show clearly what result his active life has produced on the well-being of his fellow-men, and also what is the position which he occupies as one of the 'great landmarks in the map of human nature.'

Yet we are not satisfied with a biography which regards its subject in his public capacity alone: we are naturally curious to ascertain whether the same qualities which rendered him celebrated in public followed him likewise into private life, and distinguished him there. We regard with interest in his private capacity the man who has been the originator of much public good; we look with an attentive eye on his behaviour when he stands alone, when his native impulses are under no external excitement, when he is, in fact, 'in the undress of one who has retired from the stage on which he felt he had a part to sustain.'

But a detail of the public and private events in the life of a distinguised man do not alone suffice to form a just estimate of his character. The reader requires to be made acquainted with the state of a particular branch of knowledge at the time when the individual appeared whose efforts so greatly extended its boundaries;—without this it is quite impossible to estimate the worth of the man whose life is being perused, or the blessings and advantages conferred upon society by his means.

On the other hand, in tracing the history of any particular branch of knowledge, unless connected with biography, we lose sight of individual efforts;—they are mingled with the labours of others, or are absorbed into the history of the whole, and are consequently no longer individualized:—hence we are likely to fail in recognizing the obligations due to our distinguished countrymen, or to deprive of their just merit those of our foreign brethren whose useful lives have influenced distant lands as well as their own.

With these views it is proposed to connect the lives of LINNÆUS and JUSSIEU with the rise and progress of SYSTEMATIC BOTANY. A brief sketch of the history of Botanical Science, with notices of its most distinguished cultivators up to the time of Linnæus, will *first* be given. *Secondly*, an account of the life and labours of Linnæus, the founder of what has been called the *artificial system* of plants. *Thirdly*, an account of the life and labours of Jussieu the founder of what is now so extensively known as the *natural system* of plants; concluding with a notice of the labours of the most eminent botanists from the time of the death of Jussieu. The notices of Linnæus's highly interesting Journal, written by him during his tour in Lapland, not belonging to the immediate subject of this Volume, has been inserted in an Appendix.

The writer of the present compilation desires to express his acknowledgments to the following works: Professor WHEWELL'S *History of the Inductive Sciences*;—Dr. PULTENEY'S *Account of the Life and Writings of Linnæus*, edited by Dr. MATON;—*The Eloge of Linnæus*, by CONDORCET;—*The Memoir of Linnæus* in REES' *Encyclopædia*, written by Sir J. E. SMITH; together with several other publications by the same author on the subject of Linnæus. The *Biographie Universelle*, and other standard works of reference, have also been consulted for the Memoirs of Jussieu, and other distinguished botanists, noticed in this brief sketch.

# CONTENTS.

## CHAPTER I.

### SYSTEMATIC BOTANY PREVIOUS TO THE TIME OF

PAGE

Early Knowledge of Plants—Superstitious Ideas of their Powers — Ancient Herbalists — Significant Names commonly given to Plants—Taste for Natural History among the Greeks and Romans—Industry of Pliny—His work on Plants—Dioscorides—Cultivation of Botany among the Arabs—Herbals of the Fifteenth Century — First Botanical Garden of Modern Times—Brunfels—Fuchsius—Jerom Bock—Earliest Attempts at System—Gessner—Cæsalpinus—First Steps towards a Natural System—Improvement in the Language of Botany—Clusius—Morison—Ray—Tournefort . . . . . . . . . . . 9

## CHAPTER II.

### SKETCH OF THE LIFE AND BOTANICAL LABOURS OF LINNÆUS.

Birth and Parentage of Linnæus—He is destined for the Clerical Profession—His early Fondness for Plants—Sent to School at Wexio—His Progress there—Patronised by Dr. Rothmann—His decided Attachment to the Study of Nature—Enters the University of Lund—Patronised by Professor Stobæus—His Conduct in the Professor's house—Goes to Upsal—Is relieved from extreme poverty by Professor Celsius— Patronised by Rudbeck—Journey to Lapland—Return to Upsal—Is prevented from lecturing by Rosen—Goes to Fahlun with some former Pupils—Prepares to take his Degree—Proceeds to Holland—Adventure at Hamburg—Obtains his Degree at Harderwyk—Proceeds to Leyden—Publishes his *Systema Naturæ*—Interview with Boerhaave—Visits Amsterdam—Engaged by Cliffort—Publishes several Botanical Works—Voyage to England—Interview with Sir Hans Sloane and Dillenius—Return

to Leyden—Final Interview with Boerhaave—Proposal of Van Royen—Visits Paris, and is kindly received by the Jussieus—Return to Sweden—His Difficulties—His eventual Success—Becomes Lecturer to the School of Mines, and Physician to the Admiralty—His Marriage—His Lectures—Is appointed to the Chair of Medicine and Anatomy—Visits the Islands of Oeland and Gothland—Exchanges Professorships with Rosen—Restores the Botanic Garden—Summary View of the rest of Linnæus's Career—His Death and Funeral—Disposal of his Herbarium and Collections—A Visit to Hammarby, the country-seat of Linnæus, described—Abstract of his Botanical Labours—His Reform of Botanical Terminology—Nomenclature and System. 2

## CHAPTER III.

### JUSSIEU AND THE NATURAL SYSTEM OF BOTANY.

On the Formation of a Natural System—Conditions necessary thereto—Principles of Gærtner and Adanson—Biographical Sketch of Adanson—His Birth, Parentage, and Education—Visits Africa—Publishes Natural History of Senegal—Notice of this Work—Publishes the *Familles des Plantes*—Notice thereof—His Scheme for an Encyclopædia—His Misfortunes—Illness and Death—Jussieu—His Birth and Education—Becomes Demonstrator of Botany at the age of twenty-two—His Memoir on the Order Ranunculaceæ—His Memoir on a Natural System of Classification—Objects of this System—Merit of its Formation partly due to his Uncle Bernard—MSS. Catalogues of Bernard—Jussieu publishes the *Genera Plantarum*—Notice of this Work—Its Reception—Character of Jussieu—His Death—Remarks on the Natural System—Lamarck—De Candolle—Reception of the System in England—Roscoe—Salisbury—Robert Brown . . . . . . . . . . . . . 57

## APPENDIX.

Abstract of the Journal of Linnæus kept by him during his Tour in Lapland . . . . . . . . . . . . . . . . . 77
Correspondence of Linnæus . . . . . . . . . . . . 109

# LINNÆUS AND BOTANY.

## CHAPTER I.

## SYSTEMATIC BOTANY PREVIOUS TO THE TIME OF LINNÆUS.

Early Knowledge of Plants—Superstitious Ideas of their Powers—Ancient Herbalists—Significant Names commonly given to Plants—Taste for Natural History among the Greeks and Romans—Industry of Pliny—His Work on Plants—Dioscorides—Cultivation of Botany among the Arabs—Herbals of the Fifteenth Century—First Botanical Garden of Modern Times—Brunfels—Fuchsius—Jerom Bock—Earliest Attempts at System—Gessner—Cæsalpinus—First Steps towards a Natural System—Improvement in the Language of Botany—Clusius—Morison—Ray—Tournefort.

THE perception of certain broad distinctions and resemblances between the various kinds of plants and animals, and the use of distinct words to mark and convey such perceptions, must have been essential to the very beginning of human knowledge. One of the first exercises of reason and of speech must have been to notice these distinctions and resemblances, and to give to every object a name. The inhabitants of New Zealand are said to have a distinct name for every tree and plant in their islands, and there are no less than six or seven hundred vegetable forms thus named. So among the rudest tribes it has been found that the various productions of the earth are so spoken of as to prove that the distinctions between natural objects had been observed and universally regarded.

But in the earlier periods of man's mental culture, many of those opinions on which he loves to dwell are acquired rather by his fancy and his own whims, his love of the marvellous, his hopes and fears, than by his reasoning powers. In the earliest lore respecting plants we find mythological legends, marvellous relations, and the assumption of extraordinary medicinal qualities. 'To the lively fancy of the Greeks,' says Professor Whewell, 'the narcissus, which bends its head over the stream, was originally a youth who in such an attitude became enamoured of his own beauty. The hyacinth on whose petals the notes of grief were traced, recorded the sorrow of Apollo for the death of his favorite Hyacinthus. The beautiful lotus of India, which floats with its splendid flower on the surface of the water, is the chosen seat of the goddess Lackshmi, the daughter of ocean. In Egypt, too, Osiris swam on a lotus-leaf, and Harpocrates was cradled in one. The lotus-eaters of Homer lost immediately their love of home. Every one knows how easy it would be to accumulate such tales of wonder or religion.'

Those early observers who discovered in plants some medicinal properties, either imagined more, or exaggerated such as really existed; and with the hope of health engrafted on the sentiment of wonder, we may readily suppose the patient to be credulous. Pliny says: 'Antiquity was so much struck with the properties of herbs, that it affirmed things incredible. Xanthus, the historian, says, that a man killed by a dragon, will be restored to life by an herb which he calls *balin*: and that Thylo, when killed by a dragon was recovered by the same plant. Democritus asserted, and Theophrastus believed, that there was an herb at the touch of which the wedge which the woodman had driven into a tree would leap out again. Though we cannot credit these stories, most persons believe that almost any thing might be effected by means of herbs, if their virtues were fully known.' The effects of herbs in the cure of various diseases, in cheering the spirits, and assuaging all sorts of mental as well as bodily anguish, are stated by the old writers, in terms that appear scarcely less exaggerated and ridiculous. But if the reverence of the old herbalist was superstitious and absurd, the contempt of the modern student for these useful plants is not very wise. The disparagement of what is common, and the over-estimation of all that is rare and difficult to be attained, are weaknesses to which even the most clever and intellectual persons are occasionally liable. Volumes might be written on the virtues and medicinal qualities of herbs, real or reputed; their botanical character; the uses to which they were applied in former times; the employment of them in various ways amongst ourselves, together with the quaint sayings of herbalists, and the historical and poetical associations connected with them.

King Solomon, with all his wisdom, did not consider them beneath his notice; it is declared of him, that 'he spake of trees, from the cedar that is upon Lebanon, to the *hyssop that springeth out of the wall.*' The ancient Syrians are said to have had a great predilection for gardening, and for the rearing of pot-herbs. Among the Greeks and Romans, medicinal herb-gardens were highly estimated, and frequently mentioned by their celebrated writers. The Chinese make extensive use of them; and having no schools for the study of physic, they consider it a duty to teach the uses of simples and roots to their families and domestics. The native Americans also have been observed to carry about with them such roots and herbs as they have found to possess beneficial properties.

Superstition has been mixed up with the knowledge of plants in all countries where they have been cultivated. The following lines of Virgil will show that a belief in their magical influence was prevalent among the Romans:—

> These poisonous plants, for magic use designed,
> (The noblest and the best of all the baneful kind,)
> Old Mœris brought me from the Pontic strand,
> And culled the mischief of a bounteous land.
> Smeared with these powerful juices, on the plain
> He howls, a wolf among the hungry train:
> And oft the mighty necromancer boasts
> With these, to call from tombs the stalking ghosts,
> And from the roots to tear the standing corn,
> Which, whirled aloft, to distant fields is borne:
> Such is the power of spells.——

In our own country witchcraft and the knowledge of herbs were for a long time associated together, and advantage was taken of this circumstance by Shakspeare, in his description of incantations, where he fails not to introduce 'root of hemlock,' 'slips of yew,' &c. In the reign of Henry the Eighth, the cultivation of medicinal herbs began to occupy the attention of surgeons and apothecaries; private herb gardens were planted, and Gerard, called the 'Father of English herbalists,' possessed the principal one.

By referring to the works of that excellent man, George Herbert, whose writings are full of originality and beauty, we find the knowledge of herbs to have been considered indispensably requisite to a country clergyman. Herbert wrote his *Priest to the Temple* about the year 1630, and in the admirable rules which he has laid down for the regulation of the pastor's conduct, he especially enforces the duty of attending his flock in sickness, and of being himself, as far as it is safe and desirable, their physician. He recommends the study of anatomy and physic, and the use of a herbal. He says that the reading of such subjects and the knowing of herbs 'may be done at such times as they may be a help and a recreation to more divine studies, as also by way of illustration, even as our Saviour made plants and seeds to teach the people; for he was the true householder, who bringeth out of his treasure things new and old; the old things of philosophy, and the new of grace; and maketh the one serve the other. In the knowledge of simples, wherein the manifold wisdom of God is wonfully to be seen, one thing would be carefully observed; which is, to know what herbs may be used instead of drugs of the same nature, and to make the garden the shop; for home-bred medicines are both more easy for the parson's purse, and more familiar for all men's bodies. So where the apothecary useth rhubarb or bolearmena, the parson useth damask or white roses, plantain, shepherd's-purse, and knot-grass, with better success. As for spices, he doth not only prefer home-bred things before them, but condemns them for vanities, and so shuts them out of his family, esteeming that there is no spice comparable, for herbs, to rosemary, thyme, savoury, and mints; and for seeds, to fennel and caraway seeds. Accordingly, for salves, his wife seeks not the city, but prefers her garden and fields before all outlandish gums. And surely hyssop, valerian, mercury, adder's tongue, yerrow, melilot, and St. John's-wort, made into a salve, and elder, camomile, mallows, comphrey, and smallage. made into a poultice, have done great and rare cures.'

We do not find any mention of a public herb-garden in England previous to the planting of one at Oxford, called by a writer of that day '*a spacious, illustrious physicke-garden, beautifully walled and gated;*' which took place about the year 1640. Forty-five years later the Chelsea gardens were in a flourishing state, and artificial heat was used in green-houses, which seems, by Evelyn's manner of speaking of it, to have been then a new introduction. The notice in his *Diary* is as follows:—

'I went to see Mr. Wats, keeper of the Apothecaries' Garden of Simples at Chelsea, where there is a collection of innumerable rarities of that sort, particularly, besides rare annuals, the tree bearing Jesuits' bark, which has done such wonders in quartan agues. What was very ingenious, was the subterranean heate, conveyed by a stove under the conservatory, all vaulted with brick, so as he has the doores and windowes open in the hardest frost, secluding only the snow.'

Both at the gardens of Chelsea and Kew, there are at present very superb collections of plants, and the advance in horticultural knowledge has been exceedingly rapid throughout our country. The simple herbs which find a place alike in splendid botanical gardens and in the little plat of ground allotted to the humble cottager, have many of them received most appropriate and significant names in times past, by which they are still recognised among the lower class of people. The following amusing extract from the *Journal of a Naturalist*, will give a pretty good notion of the old-fashioned plan of naming herbs and plants:—

'In ages of simplicity, when every man was the usual dispenser of good or bad, benefit or injury, to his own household or his cattle,—ere the veterinary art was known, or the drugs of other regions introduced,—necessity looked up to the products of its own clime, and the real or fantastical virtues of them were called to the trial, and thus was manifested the reasonableness of bestowing upon plants and herbs such names as might immediately indicate their several uses, or fitness for application; when distinctive characters, had they been given, would have been little attended to; and hence the numbers found favourable to the cure of particular complaints, the ailments of domestic creatures, or deemed injurious to them. Modern science may wrap up the meaning of its epithets in Greek or Latin terms: but in very many cases they are the mere translation of these despised "old vulgar names." What pleasure it must have afforded the poor sufferer in body or in limb—what confidence he must have felt of relief, when he knew that the good neighbour who came to bathe his wounds, or assuage his inward torments, brought with him such things as "all-heal, bruise-wort, gout-weed, fever-few," (fugio,) and twenty other such comfortable mitigators of his afflictions; why their very names would almost charm away the sense of pain! The modern recipe contains no such terms of comfortable assurance: its meanings are all dark to the sufferer; its influence unknown. And then the good herbalists of old professed to have plants which were "all-good;" they could assuage anger by their "loose-strife;" they had "honesty, true-love, and heart's-ease." The cayennes, the soys, the ketchups, and extra-tropical condiments of these days, were not required, when the next thicket would produce "poor man's pepper, sauce-alone, and hedge-mustard;" and the woods and wilds around, when they yielded such delicate viands as "fat-hen, lambs-quarters, way-bread, butter, and eggs, with codlins and cream," afforded no despicable bill of fare. No one ever yet thought of accusing our old simplers of avarice, or love of lucre, yet their "thrift" is always to be seen: we have their humble "penny-wort, herb-two-pence, money-wort, silver-weed, and gold." We may smile, perhaps, at the cognomens or commemorations of friendship or worth. recorded by the old simplers,—at the herbs "Bennet, Robert, Christopher, Gerard, or Basil;" but do the names so bestowed by modern science read better, or sound better? it has "Lightfootia, Lapeyrousia, Hedwigia, Schkuhria, Scheuchzeria;" and surely we may admit, in common benevolence, such partialities as "Good King Henry, Sweet William, Sweet Marjory, Sweet Cicely, Lettuce, Mary-gold, and Rose." These are epithets however so very extraordinary that we must consider them as mere perversions, or at least incapable of explanation at this period. The terms of modern science waver daily; names undergo an annual change, fade with the leaf, and give place to others; but the ancient terms, which some may ridicule, have remained for centuries, and will yet remain till nature is swallowed up by art. No; let our ancient herbalists, "a grave and whiskered race," retain the honours due to their labours, which were more needful and important ones at those periods: by them were many casualties and sufferings of man and beast relieved; and by aid of perseverance, better constitutions to act upon, and faith to operate, than we possess, they probably effected cures, which we moderns should fail to accomplish if attempted.'

The labours of the herbalists were indeed worthy of note, for a step was made towards the formation of the science of Plants, as soon as men began to collect information concerning them and their properties. The love of natural history was thus fostered at a very early period; and from the descriptions of Herodotus we see that this taste had found a place in the minds of the Greeks. Aristotle included the vegetable kingdom among the numerous objects of his study, although his treatise on Plants is lost. Theophrastus is the first writer on botany whose works we possess: but as these and subsequent writers, up to a recent period, were devoid of system, their works have not left any trace in the modern form of science: Pliny, in the middle of an active life of campaigns and voyages, contrived to accumulate by reading and study an extraordinary store of knowledge of all kinds. 'So unwilling was he to have his reading and note-making interrupted, that even before daybreak in winter, and from his litter as he travelled, he was wont to dictate to his amanuensis, who was obliged to preserve his hand from the numbness which the cold occasioned, by the use of gloves.' Traces of the errors occasioned by this hurried and broken habit of study may be found in his Natural History.

Pliny's work consists of thirty-seven books, of which no less than sixteen relate to plants. The information herein collected is very miscellaneous: the author admits with little distinction, truth and error, useful knowledge and absurd fables; and yet this work acquired an almost unlimited authority, as one of the standards of botanical knowledge in the middle ages, as well as the work of his contemporary, Pedanius Dioscorides, in which six hundred plants are spoken of in a manner which, as modern botanists declare, offers no evidence that the author observed for himself; but the main cause of the great reputation of Dioscorides in subsequent times was, that he says much of the medicinal virtues of vegetables.

Ages of darkness and lethargy now succeeded. A race of mystics, altogether distinct from the Greeks, appropriated to themselves the stores of Grecian learning. The Arabs brought to the cultivation of science 'their Oriental habit of submission, their Oriental love of wonder; and thus while they swell the herd of commentators and mystics, they produce no philosopher.' The Arabs, however, if they did not advance the boundaries of human knowledge, performed the useful offices of watchmen over the intellectual treasures of antiquity. They translated the works of the ancients and introduced them into their academies; a great number of which were established throughout the Saracen empire, from Bokhara in the remotest east, to Morocco and Cordova in the west. Yet the total number of species discovered by all botanists, Greek, Roman, and Arabian, up to the death of Abdallatif, of Bagdad, is computed by Sprengel at only fourteen hundred.

In Europe the revived acquaintance with the literature of Greece in its genuine form, gradually dispelled the intellectual clouds of the middle ages; yet during the fifteenth century, botany made no advance to a scientific form. Many Herbals were published, the chief object of which was to display the marvellous sanatory properties of plants. About the year 1490, three Herbals, with wood-cuts, were published in Germany. In 1516, *The Grete Herbal* also, with wood-cuts, appeared in England. It contains an account of more than four hundred vegetables and their products; of which one hundred and fifty are English: but are in no way distinguished from the exotics by the mode in which they are inserted in the work.

The writings of the ancients so much excited the admiration of European scholars, that they applied themselves rather to illustrate and apply what they read, than to test its accuracy. They supposed that the plants described by Theophrastus, Dioscorides, and Pliny, were those which grew in their own fields, and hence arose the misapplication of classical names to many genera. But in the sixteenth century there arose a greater independence of thought with regard to ancient writers. Some naturalists disputed with great freedom the authority of the Arabs and even of Pliny. About 1536, the first botanical garden of modern times was established on the banks of the Po by Brasavola, who published a work on the medicinal properties of plants. The Germans, however, appear to have been among the first to publish works founded chiefly on actual observation. Otho Brunfels, of Mentz, published a Herbarium in 1530, in two folio volumes, with wood-cuts, but the plants are given without any arrangement: nevertheless he deserves to be mentioned with honour as the first botanist who earnestly endeavoured to reform the science, and who published a work founded mainly on actual observation. Fuchs, or Fuchsius, the successor of Brunfels, also urged his countrymen to reject their Arabian and Latin doctors, and to observe the vegetable kingdom for themselves; and he acted in accordance with his recommendations, examining plants with zeal and accuracy, and making above fifteen hundred drawings of them.

In 1551, the Herbal of Jerom Bock showed traces of an arrangement depending upon the *natural resemblances* of plants, *i.e.* of the likeness which may be observed by the most unscientific person in the general forms and characteristics of certain plants. The introduction of such a system evidently tended to collect the scattered knowledge of plants, and introduce order and intelligence into science. In some of the most familiar plants we can easily note certain resemblances. Thus, mint, marjoram, basil, sage, lavender, thyme, dead-nettle, and many other plants, have a tubular flower, of which the mouth is divided into two lips (*Labiatæ*). The stock, the wallflower, the mustard, the cress, the lady-smock, the shepherd's purse, have their blossoms with four petals arranged crosswise (*Cruciferæ*). Other flowers apparently more complex, still resemble each other, as the daisy, marigold, aster, and chamomile (*Compositæ*). The resemblances of these plants are of far more importance than their differences; and in tracing them groups of plants, or *species*, were collected together into *genera;* and such genera as were found to agree in several points, were at length formed into a higher group called an *order;* and those orders which were most nearly related, were finally formed into the chief assemblages called *classes*. It is the gradual developement of these clear ideas of classification that we have now to trace.

In the Herbal of Jerom Bock, the Labiatæ, the Cruciferæ, and the Compositæ are for the most part brought together; and although such connexions are often mistaken; yet a new principle of arrangement was introduced, which had its influence in promoting systematic botany. The establishment of genera is probably due to Conrad Gessner, of Zurich. This distinguished naturalist, after publishing his great work on animals, died in 1565, at the age of forty-nine, leaving behind him a *History of Plants*. This work, after passing through various hands, was published in an imperfect form in 1754. The works of Gessner prove that he saw the peculiar importance of the flower and fruit, as affording the characters by which the relationships of plants were to be traced, and that he urged this view upon his contemporaries. The characters thus derived are the means by which genera are established, and hence Gessner is declared by the best botanists to be the inventor of genera.

The work of Cæsalpinus of Arezzo was published at Florence in 1583. It contains much that places its author in advance of the knowledge of the age. After speaking of the splendid multiplicity of the productions of nature, the confusion which had hitherto prevailed among writers on plants, and the growing treasures of the botanical world, he adds, 'In this immense multitude of plants, I see that want which is most felt in any unordered crowd: if such an assemblage be not arranged into brigades, like an army, all must be tumult and fluctuation. And this accordingly happens in the treatment of plants: for the mind is overwhelmed by the confused accumulation of things, and thus arises endless mistake and angry altercation.' He then states his general view, which was adopted by his successors. 'Since all science consists in the collection of similar, and the distinction of dissimilar things; and since the consequence of this is a distribution into genera and species, which are to be natural classes governed by real differences; I have attempted to execute this task in the whole range of plants; so that if, according to my slender abilities, I have done any thing to advance this study, I would offer it for the general good.' Ten classes were made out by Cæsalpinus, according to the number of the seeds and seed-receptacles, added to the consideration of whether the seed is alone in its covering, as in the cherry, or contained with several others, as in a berry, pod, or capsule. Several of these divisions were, however, further subdivided, according to other circumstances, and especially according as the vital part of the seed, which he called the heart (*cor*), is situated in the upper or lower part of the seed: but we need not dwell further on details, since our object is only to indicate the principle of the method of Cæsalpinus.

Cæsalpinus had clearly before his view the difficulty of constructing natural orders, which it is his glory to have overcome, but he shared the fate of many a man who elicits truths which his contemporaries are not prepared to receive. No one appeared for nearly a century to follow the path which Cæsalpinus had opened to system and symmetry: and his work, which formed an epoch in botanical science, was little read, and probably soon forgotten.

But the science gradually improved in its details. Clusius, or Charles de l'Ecluse, first taught botanists to describe well. 'Before his time,' says Mirbel, 'the descriptions were diffuse, obscure, indistinct, or else concise, incomplete, and vague. Clusius introduced exactitude, precision, neatness, elegance, method; he says nothing superfluous; he omits nothing necessary.' He traversed a great part of Europe, and published various works, descriptive of the rarer plants which he had examined. Among these he describes the potatoe; a plant which, as he says, was commonly used in Italy in 1586; thus throwing some doubt on the opinion that Sir Walter Raleigh, on his return from Virginia, about the same period, first introduced this useful vegetable into Europe.

Numerous additions were made to the existing knowledge of plants by travellers in the new world. Public botanical gardens became general; but systematic botany did not advance until after the restoration of the Stuarts to the throne of England, and the termination of the long and bloody wars which distracted Europe. The influence of peace upon the progress of science was very great: systematic arrangements of plants appeared in great numbers, among which must be noticed the work of Robert Morison, a Scotchman, who was wounded fighting on the royalist side, in the civil wars of England. On the triumph of the republicans, he withdrew to France, and became director of the garden of Gaston, duke of Orléans, at Blois; where he was noticed by Charles II.; who, on his restoration, invited Morison to England. He became superintendent of the royal gardens, and also of the botanic garden at Oxford. His great systematic work appeared at Oxford in 1680; but in the construction of it he appears to have borrowed largely from Cæsalpinus.

Among those whose efforts had the greatest and earliest influence in the construction of a vegetable system, was John Ray, or Wray, fellow of Trinity College, Cambridge, at the same time with Newton. He was the son of a blacksmith, at Black Notley, near Braintree, in Essex. He was born Nov. 29, 1628, educated at Braintree school, and sent thence to Catharine Hall, Cambridge, from whence he removed, after two years, to Trinity College. His progress in classical acquirements was so great, that the learned Duport, his tutor, spoke of Ray, and his friend Isaac Barrow, as the chief of all his pupils, to whom none of the rest were comparable. Nor was he deficient in mathematical knowledge, as his honours prove. He obtained a fellowship, and was chosen, in 1651, Greek lecturer of the College; in 1653, mathematical lecturer; in 1655, humanity reader; and, in successive years, other important offices were conferred upon him.

Ray acquitted himself honourably, both as a tutor and preacher, (for college preaching at that period was frequently performed by persons not ordained), and was celebrated for the solid and useful divinity contained in his sermons. His favourite study, to which he contrived to devote a large portion of time in spite of his numerous duties, was natural history. He published in 1660 a *Catalogue of Cambridge Plants*, in order to promote the study of botany, which was then greatly overlooked. This work was so favourably received that he was encouraged to extend his researches through the greatest part of England, Wales, and Scotland. At the restoration of the king, Ray entered into holy orders, and was ordained by Sanderson, bishop of Lincoln. He continued fellow of Trinity College until the Bartholomew act required a subscription against the solemn league and covenant, when he resigned his fellowship rather than sign that declaration.

In 1663 Ray in company with three friends visited divers parts of Europe, and subsequently published the *Observations* made in that tour. He became a fellow of the Royal Society in 1667, and in 1669, he, with his friend Mr. Willoughby, made those experiments and observations on the rising and falling of the sap in trees, which are published in the Philosophical Transactions. His *Catalogue of English Plants* came out in 1670, of which he speaks with characteristic humility.

In June 1673, Ray married the daughter of Mr. Oakeley, of Launton in Oxfordshire, the lady being his junior by about twenty-four years. The writings of Ray were extremely numerous, and prove the indefatigable nature of his studies. Collections of proverbs and of unusual and local words were his lighter productions, while he also brought out in 1682 his *Methodus Plantarum Nova*, and 1686 and 7 his *Historia Plantarum*, a vast and critical compilation. A supplement to this work appeared in 1704. But he also published other botanical works at this period, of which his *Synopsis* is declared to be alone sufficient to establish his fame.

In 1691 he published a work which has formed the basis of the labours of many following divines. It was called *The Wisdom of God manifested in the Works of the Creation.* Other theological pieces followed: and afterwards he wrote on quadrupeds, birds, and fishes. But increasing infirmities began to limit his writings; and in September 1698, he declared, in a letter to a friend, that he was unable so much as to walk into the neighbouring fields. Yet he continued many of his favourite studies, and especially devoted himself to that of insects. 'This great and wise man,' says his biographer, 'in the full possession of his powers, and in the anticipation of the most glorious manifestations of his Creator, did not disdain or neglect to contemplate him in his least and lowest works.' Ray died in his house at Black Notley, January 17th, 1705, in the seventy-seventh year of his age. Derham says of him, that he was devout towards God; compassionate and charitable towards his fellow-creatures; just in his dealings: humble, courteous and affable in his conversation.

The plan of arranging plants adopted by this distinguished man consists of thirty-five classes, formed according to the habit and external appearance of the plants; their greater or less degree of perfection; their place of growth; the number of seeds, fruits, petals, or sepals to each flower; the nature of the fruit, or inflorescence. His method in many respects approximated to a natural one; and Sir J. E. Smith considered that Ray, as a botanist, was eclipsed by few but Linnæus.

It would afford neither amusement nor instruction to detail the transitory systems which sprung up before the time of Linnæus. One only need be mentioned, viz. that of Tournefort, which was by far the most generally accepted, and continued to be so long after Linnæus wrote.

Joseph Pitton de Tournefort was born in 1656, of a noble family at Aix in Provence. The study of nature early drew his attention from other pursuits, and he became so diligent a collector of plants, that having exhausted the fields of his own country, and the garden of an apothecary, he went to the Alps in search of fresh objects wherewith to gratify his desire for knowledge. He studied medicine at Montpellier, and there increased his botanical acquirements; but his zeal carrying him to Cevennes, the Pyrenees, and Catalonia. he greatly enriched his collections from those sources. In these excursions he was twice robbed by the Spanish foot-soldiers, who left him nothing but his plants; and on one occasion he lay buried for two hours under the ruins of a hut in which he had taken refuge.

Returning to France with his rich collections and numerous observations, he was engaged by Fagon, chief physician to the queen, and curator of the Jardin du Roi, as assistant professor of botany. Tournefort acquitted himself so honourably in his new office, that he soon drew a crowd of students to his lectures and herborising excursions. In 1688 he received a commission to travel through Spain and Portugal, and shortly afterwards through Holland and England, that he might enrich the Jardin du Roi with the plants of those countries. By these travels he became extensively known to scientific men, and everywhere gained their friendship and esteem. In 1692 he was elected a member of the Academie des Sciences, and shortly afterwards he published his *Elements of Botany*.

In 1700 Tournefort went by command of the king to collect plants, and to make all kinds of observations in the East. In company with Gundelsheimer, a German botanist, and the artist Aubriet, he traversed the Greek islands, the borders of the Black Sea, and Mount Caucasus, Asia Minor, and Armenia, and was proceeding to Egypt, when the breaking out of the plague hastened his return. He had been absent two years; and on resuming his duties at the Jardin du Roi, he spent all his leisure time in collecting and arranging the fruit of his labours in the East, and in drawing up several works for publication, especially his travels in the Levant. But the labours he had endured were not without their effect on his naturally robust constitution. In this weakened state he unfortunately met with an accident, which proved fatal to him. A violent blow on his breast from the axle-tree of a carriage so much impaired his health, that after lingering some months he ended his industrious life, November 28th, 1708. He left his valuable zoological museum to the king, and his library to the Abbé Bignon.

Tournefort has the merit of reforming and settling genera; and it is a testimony to the ability with which he effected this, that Linnæus adopted the greater part of the genera constructed by him. A modern writer thus sums up the merits of this botanist:—'There are few of the scientific men of France, whose reputation has extended more widely than Tournefort's, and who have done more honour to their country. A judicious and methodical mind, an ingenious acuteness, joined to extensive views, are his peculiar characteristics. If he had not the profound and original genius of Linnæus, nor such an extensive knowledge of nature, in botany at least Tournefort's name still continues, in spite of the revolutions of science, to be one of the very highest that can be placed by his side; and he has in addition the glory of having opened to him, by the creation of the genera, the extensive field which he afterwards traversed.'

Tournefort arranged vegetables in twenty-two classes, of which the characters are derived,—First, from the consistence and size of the stem, thus dividing vegetables into herbs or suffruticose plants, and shrubs or trees. Second, from the presence or absence of a corolla. Third, from the flowers being simple or solitary, or compound or united into a common involucrum. Fourth, from the corolla being of one or of several petals. Fifth, from its regularity or irregularity.

The success of Tournefort's method was much promoted by the insertion in his work of a figure of a flower and of fruit belonging to each genus. The knowledge of botany was thus rendered easy, for it could be acquired by turning over the leaves of a book.

# CHAPTER II.

## SKETCH OF THE LIFE AND BOTANICAL LABOURS OF LINNÆUS.

Birth and Parentage of Linnæus—He is destined for the Clerical Profession—His early Fondness for Plants—Sent to School at Wexio—His Progress there—Patronised by Dr. Rothmann—His decided Attachment to the Study of Nature—Enters the University of Lund—Patronised by Professor Stobæus—His Conduct in the Professor's house—Goes to Upsal—Is relieved from extreme poverty by Professor Celsius—Patronised by Rudbeck—Journey to Lapland—Return to Upsal—Is prevented from lecturing by Rosen—Goes to Fahlun with some former Pupils—Prepares to take his Degree—Proceeds to Holland—Adventure at Hamburg—Obtains his Degree at Harderwyk—Proceeds to Leyden—Publishes his *Systema Naturæ*—Interview with Boerhaave—Visits Amsterdam—Engaged by Cliffort—Publishes several Botanical Works—Voyage to England—Interview with Sir Hans Sloane and Dillenius—Return to Leyden—Final Interview with Boerhaave—Proposal of Van Royen—Visits Paris, and is kindly received by the Jussieus—Return to Sweden—His Difficulties—His eventual Success—Becomes Lecturer to the School of Mines, and Physician to the Admiralty—His Marriage—His Lectures—Is appointed to the Chair of Medicine and Anatomy—Visits the Islands of Oeland and Gothland—Exchanges Professorships with Rosen—Restores the Botanic Garden—Summary View of the rest of Linnæus's Career—His Death and Funeral—Disposal of his Herbarium and Collections—A Visit to Hammarby, the country-seat of Linnæus, described—Abstract of his Botanical Labours—His Reform of Botanical Terminology—Nomenclature and System.

AT length a new era arose in the history of Botany, and a genius of a very high order was applied to the task of clearing away all that was vague and obscure in the systems already advanced, and of producing a complete reform in the science.

Karl Linnè, or, as he is more commonly styled, Linnæus, was born on the 23rd of May, 1707, at Rashult, in the province of Smaland, in Sweden. His father *Nils*, whose ancestors were peasants, was pastor of the hamlet of Rashult, and of the neighbouring village of Stendrohult: and being the first learned man of his house, he followed the common custom of Sweden, and changed his family name, borrowing that of Linnè from a large linden-tree, which stood in the vicinity of his native place.

The young Linnæus was intended for the clerical profession, but the design of his parents was frustrated by the strong propensities of the child for natural objects. The love of flowers displayed itself early, and this taste was encouraged and promoted by the parents. Sir James Smith remarks, 'Of the taste which laid the foundation of his happiness as well as his celebrity, his worthy father was the primary cause. Residing in a delightful spot, on the banks of a fine lake, surrounded by hills and valleys, woods, and cultivated ground, his garden and his fields yielded him both pleasure and profit; and his infant son imbibed, under his auspices, that pure and ardent love of nature for its own sake, with that habitual exercise of the mind in observation and activity, which ever after marked his character, and which were enhanced by a rectitude of principle, an elevation of devotional taste, a warmth of feeling, and an amiableness of manners, rarely united in those who so transcendently excel in any branch of philosophy or science, because the cultivation of the heart does by no means so constantly as it ought keep pace with that of the understanding.' A separate spot in the garden was assigned to Charles's own management, and was soon enriched with a copious collection, not only from his father's well-stocked parterres, but from the woods and fields in the vicinity. The pastor himself appears to have had considerable botanical knowledge, and the maternal uncle of the young naturalist is said to have been conversant with plants and horticulture. From the time that he first left his cradle Charles almost lived in his father's garden, which was planted with some of the rarer shrubs and flowers.

'He was scarcely four years old when he accompanied his father to a feast at Möklen, and in the evening, it being a very pleasant season of the year, the guests seated themselves on some flowering turf, listening to the pastor, who made various remarks on the names and properties of the plants, shewing them the roots of the Succisa, Tormentilla, Orchides, &c. The child paid the most uninterrupted attention to all he saw and heard, and from that hour never ceased harassing his father with questions about the name, qualities, and nature of every plant he met with; indeed, he very often asked more than his father was able to answer; but, like other children, he used immediately to forget what he had learned, and especially the names of plants. Hence, the father was sometimes put out of humour, and refused to answer him, unless he would promise to remember what was told him. Nor had this harshness any bad effect, for he afterwards retained with ease whatever he heard. All the child's powers, both of mind and body, conspired to make him an excellent natural historian; besides his retentiveness of memory, he had an astonishing quickness of sight.'

Thus favourably situated for pursuing what proved to be the natural bent of his mind, Linnæus sought all the diversions of his childhood in the garden and fields, and imbibed that deep love of nature which followed him through life. His father instructed him in the elements of the Latin language, geography, and other departments of knowledge. At the age of seven he was placed under a teacher, who was in no way qualified for his profession: three years afterwards he was removed to a grammar-school, near Wexio, where the master unfortunately preferred stripes and punishments to admonitions and encouragements. Accordingly, Linnæus made very little progress in the studies connected with his intended profession; his ardent love of nature was in no wise fitted to prepare him for the close application and severe studies of the school or university.

'He had no taste,' says Sir J. Smith, 'for Greek or Hebrew, ethics, metaphysics, or theology; but he devoted himself with success to mathematics, natural philosophy, and a scientific pursuit of his darling botany. The *Chloris Gothica* of Bromelius, and *Hortus Upsaliensis* of Rudbeck, which made a part of his little library, were calculated rather to fire than to satisfy his curiosity, while his Palmberg and Tillands might make him sensible how much more than they had accomplished still remained to be done. His own copies of these books, used with the utmost care and neatness, are now before us.' When Linnæus's father paid a visit to Wexio, the preceptors of the youth pronounced him unfit for any learned profession, and recommended his father to apprentice him to a tailor, shoemaker, or some handicraft trade. Happily for the progress of natural science, this advice was not acted on by the disappointed parent.

Although at Wexio the abilities of Linnæus were estimated meanly, yet there was one person who had noticed the peculiar genius and pursuits of the boy; this was Dr. Rothmann, professer of medicine in the college at Wexio; and he kindly gave his assistance and advice, and offered to take the youth into his family, and to provide for him for one year. After much hesitation the elder Linnæus accepted this generous offer, and hoped to see his son properly qualified for the medical profession. The father then determined to educate his second son Samuel for the church; and fearing lest the love of plants might again defeat his object, he prohibited the boy from entering the garden, and even from gathering field-flowers. This very restriction probably made Samuel a botanist; but his love for plants not being so ardent as that of his elder brother, his parents were not deprived of the gratification of seeing him in due time become a minister.

Meanwhile the elder brother, who had hitherto studied botany without a method, found in the house of Rothmann Tournefort's work (already mentioned), which served to enlarge his views and increase his zeal. His love of knowledge increased with his acquaintance with nature, and his frequent botanical excursions soon made his acquirements conspicuous. He attempted to arrange into systematic order the plants growing around him, but he found it difficult to determine many of the species in consequence of the imperfect manner in which they had been noticed. He stayed three years at the college of Wexio, and by the time he had completed his twentieth year, he was in no way noticed except as a young man foolishly engrossed by the study of natural objects, while he ought to have been cultivating more important pursuits. In 1727 he was matriculated at the university of *Lund*.

It was in one of his herborizing excursions near Lund, that Linnæus met with an accident which had nearly proved fatal to him. And here it is necessary to state that the inhabitants of Bothnia and Finland are subject to a peculiar malady, which is most prevalent in the autumnal months, and causes excruciating pain. This malady is attributed to the attack of a small animal which is said to penetrate the skin, and bury itself so deeply in the flesh, that it only leaves a black dot or point at the spot where it entered. This is soon succeeded by inflammation, gangrene, swooning, and death; all which happens in the course of a day or two, or frequently even within a few hours, unless the animal be immediately extracted from the flesh, and this must be effected with the utmost caution, by applying a poultice of cheese or curds; or, if these fail, dissecting between the muscles where it had entered. That this malady is indeed caused by an animal or insect has been much doubted, and often denied by scientific men: but Linnæus was certainly impressed with the idea of the fact being so, and he accordingly named the animal *Furia infernalis*. Being attacked in the manner above described, he was indebted to the kindly offices of a priest for the necessary aid. The priest lacerated the flesh, and extracted a vermiform substance, about half an inch in length, which he produced to Linnæus, assuring him that this was the whole and sole cause of his disorder. Linnæus, notwithstanding its injured appearance, pronounced it to be a true vermes, and gave it the above name, from an idea that it realized the description of the fatal powers ascribed by the ancients to an imaginary animal so named.

At this university Linnæus had a relative who was professor, and who had promised to support him; but on his arrival our young naturalist was grieved to find his relative dead. But fortunately for Linnæus he met with a friend with sufficient penetration to discover his genius and peculiar talent. This was Dr. Stobæus, professor of medicine and botany, who perceiving the industry and attention of Linnæus, and learning his narrow circumstances, received him into his house. Here he found a small collection of natural objects which he studied with delight; but he does not appear to have had free access to the library of Dr. Stobæus, for we learn that he procured books from it through the agency of a young German who lodged in the same house. Linnæus would frequently devote the greater part of the night to study, and the doctor, noticing these nocturnal vigils, fancied that his pupil was making merry with the servants after his family had retired to rest. He therefore watched his proceedings, and one night at a late hour suddenly burst into his chamber, and was surprised and delighted to find him deeply buried in the mysteries of Cæsalpinus, Banhin, Tournefort, and other botanical works. The doctor then gave Linnæus a free access to his library, and evinced a greater attachment to him; gave him lessons on petrifactions and molluscs; instructed him in medicine; admitted him to his table: and sent him occasionally to visit his patients.

In 1728 Linnæus visited his parents. His mother sighed to see her son employ his whole time in collecting plants, or drying them and sticking them upon paper; and she abandoned the long-cherished hope of seeing him become a preacher. Here he again saw his friend Rothmann, who advised him to visit Upsal, where he would have the advantage of a splendid library and a fine botanic garden, and hinted the possibility of his talents acquiring for him a pension from government wherewith to pursue his studies. He accepted the advice, received a small sum of money from his father (only eight pounds), and departed. But alas! the beautiful visions with which Rothmann had inspired him were not realized; the professors looked coldly on him; his money was soon spent; and though he obtained a royal scholarship, it proved quite insufficient to maintain him, so that he was grateful for the bounty of his fellow-students when they offered him an occasional meal or a cast-off garment. The old shoes which they gave him he was forced to patch up with pasteboard and birch-bark. His talents were not in request, private pupils were not to be obtained by a poor unknown student, and thus his indigence became extreme: his father had told him that he could no longer support him; his friend Stobæus, whom he had quitted abruptly, he feared to seek, and he knew not where to get shelter and food. Yet he despaired not; his religious principles gave him strength and hope, and we find him in after years referring to these privations in the spirit of a good man and a Christian—'I thank thee, Almighty God,' said he, 'that in the course of my life, amidst the heavy pressure of poverty, and in all my other trials, thou hast been always present to me with thine omnipotent aid.'

The circumstances of Linnæus were rendered less desperate by his obtaining the notice of Olaus Celsius, who was preparing a work illustrative of the plants mentioned in the sacred scriptures. In the autumn of 1729, Linnæus was one day very intently examining some plants in the academical garden, when a venerable old clergyman entered and asked him what he was about; whether he was acquainted with botany, and how long he had studied that science. Linnæus replied to these questions, and on being further questioned he named a variety of plants according to the system of Tournefort, and said that he had above six hundred indigenous plants preserved in his cabinet. The gentleman was Dr. Olaus Celsius, who on learning the condition of Linnæus, invited him to his house, supplied him with every necessary, and obtained his assistance in the work about which he was engaged. Thus was Linnæus again protected, his tastes encouraged, and his genius fostered.

The friendship of Celsius soon procured other advantages. The son of professor Rudbeck, and other young men, became his private pupils, and thus his finances were improved. He also formed an intimate friendship with Peter Arctedius or Artedi, who afterwards became celebrated for his knowledge of fishes, and of umbelliferous plants; but was unfortunately drowned in a canal at Amsterdam, when he was only thirty years of age. Linnæus was witness of the sad accident, though unable to save his friend.

Hitherto Linnæus had been indebted to Tournefort's work for his systematic knowledge of plants; but happening to meet with a small work of Vaillant on the structure of flowers, he saw at once many of the defects of the system he had hitherto adopted; and from the ingenious remarks of the latter writer on the sexes of plants, he conceived the idea of a system of botany founded on the stamens and pistils. He now studied on a new plan; his thoughts were continually occupied with the subject of the sexual distribution of plants, and the knowledge which he acquired in this department became the groundwork of his future eminence. A small treatise which he composed about this time on the subject of an academical disputation attracted the notice of Rudbeck, professor of botany, who being aged was desirous of obtaining a competent assistant. He invited Linnæus to his house, made him his deputy-lecturer, and assigned him the office of demonstrating plants in the botanic garden. Rudbeck's knowledge of zoology and his collections of birds were extremely useful to Linnæus, and having a fine library at command, his condition was more favourable than he had hitherto known it. His mornings were at this time devoted to his public duties; his evenings to preparing some botanical works. The clouds of poverty and obscurity were gradually dispelling; he became known to men of talent, and his remarkable powers of mind united with his great strength of constitution, pointed him out as the fit instrument in an important undertaking.

The Royal Academy of Sciences at Upsal had for some time contemplated the desirability of enlarging and improving the natural history of Sweden, by an investigation of the productions of the Arctic regions. An expedition had already been sent out by Charles XI., but the specimens which were brought home had been destroyed by the great fire in 1702, and it was proposed to repair the loss by sending out another scientific traveller. Finding in Linnæus a person whose reputation as a naturalist already stood high, and whose unwearied activity was also recommendatory in an undertaking of this nature, the Academy deputed him to the task in 1731. On the 12th of May, in the following year, he set out upon his journey into Lapland. After travelling on horseback and on foot about three thousand eight hundred English miles, and encountering many hardships and privations, he returned to Upsal in November following. A very interesting journal kept by him during this tour was translated into English some years ago, an abstract of which is given in an appendix to the present notice. It evinces the amiable spirit of the writer, and the closeness of observation for which he was so remarkable. From the experience of this journey, he was able to publish his admirable *Flora Lapponica*.

During his tour Linnæus learned the art of assaying metals, and as that subject had never been taught at Upsal, he gave a course of private lectures on it in the following year.

On his return to Upsal, Linnæus was elected a member of the Royal Academy of Sciences, and this was the only reward for his late arduous journey, except a small bursary which he soon lost; but he hoped for a more favourable reception for his public lectures, which in 1733 he began to deliver. But unfortunately he had not taken his degree, and thus was he legally disqualified for the office of lecturer. An envious rival, Dr. Nicholas Rosen, taking advantage of this circumstance, denounced Linnæus to the senate of the university, and they prohibited him from continuing his course. The indignation of Linnæus prompted him to commit personal violence on the author of this new misfortune; but happily he was prevented by the influence of the bystanders. This new offence would probably have caused his expulsion from the university, but for the interference of Celsius.

Being prohibited from lecturing, Linnæus accepted the invitation of some of his former pupils to accompany them on an excursion to the mines of Fahlun and other places. He did so in the year 1733, and at Fahlun was introduced to Baron Renterholm, governor of the province of Dalecarlia, and addicted to the study of natural history. This gentleman invited Linnæus to accompany his two sons as travelling tutor. They set out in 1734, and extended their excursion as far as the mines of Roraas in Norway. On his return Linnæus spent some time at Fahlun, lecturing on mineralogy. Here he first saw the lady who afterwards became his wife; but not having taken his degree, and without the means of doing so, he could not think of marrying: the lady, however, who had saved one hundred dollars out of her pocket-money, offered them to Linnæus, and he then determined (as was customary at this time for Swedish students), to take his degree at some foreign university, where it could be procured at least expense.

In April 1735, he set out for Hamburg, and on his arrival determined to pass some time there in order to inspect the collections contained in that city. In the museum of John Von Spreckelsen was a valuable preparation of a reptile with seven heads. It had been pledged for a loan of ten thousand merks, and was considered a most rare object. Linnæus on examining it discovered two heads to be those of some small quadruped, artfully covered over with the skin of a serpent. Making known this discovery, the wonder was at an end; Spreckelsen became nearly bankrupt, and Linnæus was forced to quit Hamburg to avoid the unlucky consequences of his sagacity.

Having obtained his degree in Holland, he was anxious, before he returned home, to become known to some of the eminent Dutch naturalists. He proceeded to Leyden, where he made the acquaintance of Professor Royen, Dr. Van Swieten, Lieferkuhn, Gronovius, and others. By the advice and aid of these gentlemen, he published his *Systema Naturæ* in fourteen folio pages. The illustrious Boerhaave was at that time the most eminent man in the university of Leyden, and Linnæus was anxious to converse with him; but being unable to obtain an interview on application, he wrote to him and inclosed a copy of his treatise. Boerhaave immediately sent for the young naturalist, and expressed surprise and congratulation at his extensive knowledge, advised him to remain in Holland where he would certainly make his fortune; but the light purse of Linnæus would not have allowed him to adopt this advice, had he not at Amsterdam been kindly welcomed by Professor Burmann, who was then occupied in describing the plants of Ceylon. 'Do you wish to see my plants?' inquired the professor; 'which of them would you inspect?' He held out one, and said, 'This is very rare.' Linnæus asked for a single flower, and softened it in his mouth, examined it, and pronounced it to be a species of laurus. 'It is not a laurus,' said Burmann. 'But it is,' said Linnæus; 'it is the cinnamon-tree.'—'It certainly is the cinnamon,' rejoined the other. Linnæus then convinced him that this tree was a species of laurus, and also corrected his classification of other plants. At length Burmann invited him to lodge in his house and assist him in his work; a proposal which was joyfully accepted.

While at Amsterdam he was recommended by Boerhaave to Mr. George Clifford, burgomaster, and one of the directors of the Dutch East India Company, who placed his fine garden and herbarium under the care of Linnæus, and treated him with the greatest liberality. This was a period of incessant occupation with Linnæus. He was not only engaged in the examination and arrangement of Mr. Clifford's collections of plants, and of the contents of his museum of natural history, but was likewise superintending the publication of his *Critica*

*Botanica*, *Flora Lapponica*, *Genera Plantarum*, and of a fine folio volume called *Hortus Cliffortianus*, a complete catalogue of his patron's garden, which was full of learned research, and illustrated with numerous plates. This last work was published at the expense of Mr. Cliffort, and distributed gratuitously among his friends.

The *Flora Lapponica*, written at this time, is thus noticed by Sir J. Smith:—'This work, one of the happiest literary compositions of its author, is strikingly characteristic of the state of his mind at the time it was written. It is redundant in observation and reflection on every subject which could be interwoven with its professed object, conveyed in the most engaging style; a style independent of studied phraseology, flowing directly from the heart, and deriving its principal charm from the delight which the author takes in what he has to communicate. The enthusiasm with which his imagination retraces every idea of his Lapland expedition, turns the wild scenes of that country, even in the mind of his reader, into a paradise, inhabited by all that is innocent and good. His effusions resemble the longings of an exiled Swiss; and are, in fact, incipient symptoms of that oppression of the heart, which after a while rendered his abode in Holland, with all its scientific charms, no longer tolerable to one born in the purer air of Sweden, and nurtured among her Lapland alps.'

Mr. Cliffort being desirous of adding to his collection, sent Linnæus to England to obtain new species. He received a letter of introduction, written in Latin, from Boerhaave, to Sir Hans Sloane, in which he says, 'Linnæus, who will deliver to you this letter, is alone worthy of seeing you, and of being seen by you. They who witness your meeting will behold two men whom the world can scarcely equal.' This pompous introduction did not procure a very favourable reception; nor can it be expected that the old man should look with a kindly eye upon one whom he regarded as an innovator in his favourite science. The same feeling influenced Dillenius, the celebrated professor of botany, when Linnæus proceeded to Oxford. 'See,' said he to his patron

Sherard, 'this is the young man who confounds all botany;' and proceeding to the garden, the professor treated the presumptuous youth with open contempt. The next day Linnæus called to take his leave. 'Before I go,' said he, 'I have to request one favour; tell me why you accuse me of confounding botany.' He at first refused to explain, but on further entreaty, he referred to the pages of the *Genera Plantarum*, where Linnæus found a N.B. on almost every page, and was informed that those letters marked the false genera. Linnæus denied this, and the professor referred to a plant in the garden, which he and other botanists considered to possess three stamens. On examination it was found to have only one, as Linnæus had stated. 'O, it may be so accidentally in a single flower!' said the professor; but on examining a number of them, they all presented the same peculiarity which the Swede had described. The professor who had been slow in belief was not so in generosity, for he detained Linnæus for several days, and complied with his request, before denied, to supply him with the plants which Cliffort wished to procure. Linnæus added greatly to his own collection of plants and of books during this visit to England; and made acquaintaince with Dr. Shaw, Professor Martyn the elder, and Phillip Miller, a celebrated gardener to the Society of Apothecaries.

After his return to Holland, and during the year 1737, Linnæus published about two hundred sheets of original matter. The *Genera Plantarum* contained the characters of nine hundred and ninety-five genera of plants, according to the number, form, situation, and proportion of their reproductive organs: of these genera sixty were subsequently published in a supplement, to which he also added a concise view of his system. In this work he had not greatly reformed the trivial nomenclature of plants which then existed; but even seemed to give currency to these trivial names, because, perhaps, he did not dare to introduce so startling a novelty as a complete set of new characters or technical terms. He did so in many examples, but placed them only in the margin of the work; 'I have placed them there,' he says in his preface, 'that without circumlocution we may call every herb by a single name; I have done this without selection, which would require more time. And I beseech all sane botanists to avoid most religiously ever proposing a trivial name without a sufficient specific distinction, lest the science should fall into its former barbarism.'

The condition of Linnæus had been so prosperous, under the patronage of Mr. Clifford, that he was able to gratify the generous dictates of his heart by assisting his beloved friend Artedi, whom he met in Amsterdam, destitute of the means of prosecuting his studies, obtaining his degree, or even of supporting himself with common decency. This young man, whose subsequent fate has been already alluded to, had 'spent all his money in London,' and now owed everything to the exertions of his friend, by whom he was introduced to Leba, who made use of the learning and abilities of Artedi in completing the third volume of his magnificent *Thesaurus*, chiefly devoted to fishes.

The severe labour and unremitting industry of Linnæus, during his stay in Holland, at length proved too much for his health. He had every luxury and indulgence at his command, but though caressed by his patron and other scientific men, he longed for his native country. Yet, after he had left Mr. Clifford, he was induced to remain awhile at Leyden, in order to assist Professor Van Royen in the arrangement and description of the garden there. Here he composed and printed the *Classes Plantarum*.

Having completed his engagements at Leyden, Linnæus preparing to depart, went to take leave of Boerhaave. Linnæus himself thus relates the interview: 'That great man, who was affected with a dropsy of the chest, which forced him to keep himself always sitting in his bed to avoid suffocation, would not receive visitors, but admitted me to bid him farewell. Summoning the little strength that remained in him, he raised my hand to his lips, and said—"I have finished my career, and all that I have been permitted to do, I have done; may God preserve you, who have yet a greater task to perform! What the learned world expected from me, it has obtained; but it expects much more from you, my dear son. Farewell, farewell, my dear Linnæus!"'

We may here mention a circumstance which reflects honour on Linnæus. Van Royen, professor of botany, had made proposals of marriage to the only daughter and heiress of Boerhaave; had been rejected; and therefore became hostile to the family. The botanic garden which he superintended had been arranged and described according to Boerhaave's method; but Van Royen determined now to adopt that of Linnæus, not so much because he considered the latter to be superior, but to get rid of the associations connected with a man who had slighted him. He offered Linnæus a salary of eight hundred florins to assist in carrying out the scheme. But the respect which Linnæus felt for his deceased friend would not allow him to accept the offer as it was made to him; but he remained with Van Royen for a time, classed the plants after a system of his own, and made a catalogue of them, which was published in Van Royen's name.

Sir J. Smith alludes to the dejection of spirits felt by Linnæus at this period, which, together with the influence of the climate of Holland, brought on a very formidable intermittent fever. News had reached our naturalist, that a rival in the affections of his intended wife had appeared, and had also gained the esteem of her father. This intelligence arriving at a time when he was weakened by literary exertions, and an unsuitable atmosphere, was not unlikely to have been the cause of his dangerous attack. The kindness of the amiable Cliffort, who again received him under his roof, and the skill of Van Swieten, appear to have been largely instrumental in his recovery. After some weeks he set out, though still weak, on his journey, and when he gained the more elevated country of Brabant, he felt in one day quite renovated; his whole frame being, according to his own expression, 'freed from some great burthen.' He bore a very handsome introductory letter from Van Royen to Antoine de Jussieu, though it is said, that previously to delivering it the following incident occurred. On his arrival in Paris he proceeded immediately to the Garden of Plants, where Bernard de Jussieu, a clever botanist, was describing some exotics in Latin. One of them remained unexplained, and seemed to embarrass the demonstrator. Linnæus looked on in silence, but remarking the hesitation of the professor, he exclaimed in Latin, 'It has the appearance of an American plant.' Jussieu was surprised; he turned round quickly, and said, 'You are Linnæus.' The lecturer then gave him a cordial welcome. Jussieu introduced him to the scientific circles and collections at Paris; but he was regarded by all as 'a young enthusiast, who confounded all; and whose only merit consisted in having reduced botany to a state of anarchy.' Reaumur afterwards spoke of him thus: 'Linnæus was now anxious to return to Sweden without further delay, for time seemed to him too valuable to allow him to engage in studying the manners and language of the French. He never had a genius for languages, nor could he ever render himself familiar with the English, French, German, or even the Lapland tongues. He felt the same difficulties with respect to Dutch, although he had resided three years in Holland. This, however, fortunately did not prevent him from making himself sufficiently understood. After seeing all the curiosities at Paris, he went to Rouen. There he embarked for the Cattegat, with a favourable wind, and after crossing the Sound landed at Helsingburg. He immediately visited his old father at Stenbrohult, rested there a few days, and set out for Fahlun.' Here his reception from the lady of his choice was favourable, and he was formally betrothed to his bride. But it was necessary that some prospect of an advantageous settlement should be effected, before Linnæus could marry; and it was thought that Stockholm afforded a promising theatre for a young man of talent in the medical profession.

Linnæus, whose name was now known, and his works discussed throughout Europe, naturally expected an honourable welcome back to his native land. But he was doomed to suffer disappointment; he thought himself neglected at Stockholm, and even treated with contempt: and though in order to obtain his livelihood he was constrained to follow the profession of medicine, yet here the public opinion was unfavourable; for 'what,' it was said, 'could a mere botanist know of the art of healing?' Sir J. Smith thought Linnæus rather unreasonable in the expectations he had formed of his reception at Stockholm, as will appear from the following: 'The scientific merits of Linnæus were not overlooked, as he was unanimously chosen a member of the Upsal Academy, the only one then in Sweden; yet the homage he had so lately received abroad, seems to have made him a little unreasonable on this head, and he declares that he would certainly have quitted his native country, "had he not been in love." To this all powerful deity, therefore, and not to his merits, or the wisdom of his country in discerning them, was Sweden in the first instance indebted for the possession of her Linnæus. From his country however flowed his most abundant reward, for whatever emolument his matrimonial connexion might afford, it certainly brought him little happiness or honour.'

Linnæus continued in embarrassed circumstances until the summer of 1739, when his practice began to increase. He was visited about this time by the great Haller, who offered him the botanical professorship at Gottingen, but preferring, for the reason just named, to live in his own country, he declined it. A trifling circumstance, which has made the fortune of many a medical man, turned the tide in favour of Linnæus. An influenza becoming prevalent, he visited the lady of an Aulic councillor, and prescribed for her a remedy which she was to carry about with her for occasional use. Being one day at court, the queen Ulrica Eleanora observed this lady putting something into her mouth; and on inquiry she was informed of Linnæus, and sent for him to prescribe for a cough which troubled her;

he did so, and removed the complaint, and thus he soon became the fashionable doctor of the place.

Fortune and misfortune have their own peculiar powers of attraction: the favours of the one and the attacks of the other seldom come singly. Linnæus was now sought out by the rich and powerful, not so much for his talents and genius, as for his popularity. He attracted the attention of Count Tessin, who asked him if there was any office for which he wished to petition, as the diet was then sitting. He replied, with the dignity of genius, that he wanted nothing; but on further persuasion, prudence led him to prefer the modest request that the lectureship to the school of mines, worth about two hundred ducats a-year, might be conceded to him. This was granted, and soon after the count procured for him the important office of physician to the admiralty. Linnæus being now in prosperity, completed his engagement with Miss Moræus. The marriage took place at Fahlun, on the 26th of June, 1739.

In 1740 he delivered lectures on botany, and published a new edition of his *Fundamenta Botanica.* His medical practice increased; his lectures, his duty as physician to the admiralty, and his private studies, kept him in active employment. About this time his former protector, Rudbeck, professor of botany, having died, Linnæus applied for the office, which, however, was given to his old rival Rosen. The king was anxious for Linnæus to have the office, but the matter rested on a promise that he should succeed Roberg, who then held the professorship of medicine and anatomy, and being advanced in years was about to resign; nevertheless, when the office became vacant, Linnæus had some difficulty in obtaining it: the affair was referred to the diet, when it was at length decided in his favour.

Government having resolved to send an expedition to some of the remoter provinces of Sweden, for the purpose of promoting the home-manufactures, Linnæus applied for a share in the office, and it was granted. In this expedition, which was accompanied with much personal suffering, we need not follow him. On his return he resumed his duties as successor to Roberg, and gave a discourse before the university, displaying the benefit to be derived from such expeditions, and the wide field of observation thus opened to the student. He became reconciled to Rosen, and entered into an amicable arrangement with him to exchange offices: Rosen took the chair of anatomy and physiology, and Linnæus that of botany, materia medica, dietetics, and natural history.

Linnæus did not escape the common lot of genius, which is to excite envy and opposition: but we willingly pass over the cavils of the obscure, and the annoyances to which they subjected the mind which they could not appreciate, and view Linnæus in his proper element. The botanical garden, founded fifty years before by Olaus Rudbeck (the father of the one already named), had been destroyed by the great fire of Upsal in 1702, and Linnæus succeeded in getting it restored. Hot-houses were built, walks formed, ponds dug, plats supplied with plants, and a house erected for Linnæus, who could no longer complain of the neglect of his countrymen.

The extensive correspondence which Linnæus maintained with the first botanists in Europe enabled him to enrich the academical garden with a great variety of plants. Jussieu and Van Royen sent him Indian plants; Haller and Ludwig, European ones. Dillenius supplied him with a variety of annuals, and Mr. Collinson, Mr. Catesby, and others, with American plants, while his pupils Thunberg, Hasselquist, Kalm, Osbeck, and others, gave him full information, and furnished him with specimens resulting from their travels in Europe, Asia, Africa, and America.

Valuable foreign plants, insects, and other rarities, now poured into Sweden from all quarters. The king and queen displayed the greatest interest in the subject of natural history, and kept each their separate collections. The museum of the king was at Ilbricksdahl, and that of the queen at the palace of Drothingholm; the latter being very rich in exotic insects and shells.

The arrangement and description of both these collections devolved on Linnæus, whose studies were by no means confined to botany, though his most valuable works were written on that department of science. The Queen of Sweden took so much pleasure in the company and conversation of Linnæus, that she allowed him his habitual indulgence of smoking, even in her apartments, that he might continue his labours in arranging her collection of insects, &c., with the more ease and satisfaction to himself.

Amidst all the honours that were showered upon Linnæus, nothing gave him so much delight as the accidental discovery of the herbarium made by Hermann in Ceylon. An apothecary of Copenhagen had become possessed of this herbarium, without knowing its value, and being anxious to obtain information, took it to Linnæus, who soon discovered to whom it originally belonged, and rejoiced exceedingly at the discovery of a treasure which had been supposed irrecoverably lost. He laboured day and night in examining the flowers, and hence originated his *Flora Zeylanica*, published at Stockholm in 1747.

The remaining years of the life of Linnæus were highly prosperous as regards his fame and worldly circumstances. In 1757 he was elevated to the nobility, and took the title of Von Linné, and in the following year he purchased the estates of Hammarby and Sæfja, at a sum more than equal to two thousand three hundred and thirty pounds. The rapid increase of wealth and honour which he now experienced did not in any wise diminish his assiduity in study, or the extent of his publications. An extraordinary number of works were completed by him in various departments of natural history, and all of them evinced the same clearness of ideas and precision of language which have made his writings so especially valuable. It would occupy too much space to describe the numerous dissertations which flowed from his pen, or even to recount their titles: we shall presently have to refer to those which had so large a share in promoting botanical science.

In 1749 he had a fit of the gout, so severe as to endanger his life. He always attributed his restoration from this fit, and also from subsequent ones, to his eating wood strawberries, the only sort then known in Sweden. His servants were ordered to purchase throughout the season all that were brought to his door, and these formed a principal part of his diet.

Towards the close of his life, Linnæus, who for a long period had enjoyed a sound and excellent constitution, was attacked by apoplexy, which in some degree impaired his powers of mind, and likewise induced other complaints. The first attack of this nature occurred at the close of 1776. In the following year he suffered a second stroke, and after a long illness died on the 10th of January, 1778, in the seventy-first year of his age. The remains of this celebrated man were interred at Upsal cathedral, and the funeral procession was composed of the members of the whole university, the pall being supported by sixteen doctors of physic, all of whom had been his pupils. A general mourning took place at Upsal, and the king Gustavus III. ordered a medal to be struck expressive of the public loss, one side of which exhibits the bust of the great naturalist with his name, and the other Cybele in an attitude of grief, holding in her left hand a key and surrounded by animals and plants. This monarch likewise attended a meeting of the Royal Academy of Sciences at Stockholm, in commemoration of the great naturalist, and in his speech from the throne alluded to the death of Linnæus as a public calamity.

It is scarcely necessary to say anything of the private character of this great man; since his piety, industry, and benevolence, have been alluded to in the foregoing pages, and will be illustrated by his private journal, kept during his Icelandic tour, an abstract of which is given at the conclusion of this notice. He has been accused of vanity; whether justly or not we do not pretend to say; but if any one may be pardoned in remarks that seem to savour of this weakness, surely it is the man who during the latter years of his life was almost overwhelmed with adulation, and whose society was courted by royalty. His habits were temperate and regular, and everything in his own turn of mind seemed to promise peace and enjoyment. Yet his marriage with the daughter of Dr. Moræus was a great misfortune. Sir J. Smith describes this lady as not only making the home of Linnæus as uncomfortable as she could, by the meanest parsimony and disgusting petty tyranny, but as being actually unfaithful to her husband, and as harbouring a most unnatural hatred for her only son, towards whom she exercised every affront and persecution that came within her power; and even induced Linnæus, on one or two occasions, to act towards him with injustice and severity.

The family of Linnæus 'consisted of two sons and four daughters; but the younger son died at the age of three years. The eldest daughter, Elizabeth Christina, is recorded as having discovered a luminous property in the flowers of the nasturtium, which are sometimes seen to flash like fire in the evening of a warm summer's day. This lady was married to an officer in 1764. The eldest son became justly respected and celebrated, but the troubles of his home weighed heavily; and owing to the mercenary conduct of his mother, he had to purchase, at her own price, the library, manuscripts, herbarium &c. of his lamented father, which he ought to have inherited. When wishing to travel, this worthy but unfortunate young man was obliged to pawn his own herbarium for a loan of fifty or sixty pounds. He visited England France and Holland, and met with a flattering reception, and academical honours. His career was cut short by fever, concluding with a stroke of apoplexy, of which he died November 1st, 1783, in the forty-second year of his age. He never married, and his museum and library reverted to his mother and sisters. The former immediately endeavoured to obtain a high price for them; and they were eventually sold to Sir J. Smith, of which it is said, the Swedish government was so jealous, that they tried, though too late, to prevent these monuments of their countryman's labour and glory from being carried out of his native land, and even sent a frigate in pursuit of the ship which conveyed them to England. Hither they were nevertheless brought, and after the death of Smith they were purchased by the Linnæan Society. Since they have been in this country these relics have been the object of pilgrimage to botanists from various parts of Europe.

In the *Transactions of the Swedish Horticultural Society* for the year 1835, is an interesting account of a visit to Hammarby, the country-seat of Linnæus, in the spring of 1834, by the royal Swedish physician, M. Af Pontin; a translation of which appeared in Mr. Loudon's *Gardener's Magazine* for 1838. We have made the following abstract of this account, as forming an appropriate sequel to our memoir of Linnæus.

Before leaving Upsal, M. Pontin and a few friends paid a respectful visit to the only remaining branch of Linnæus's family, *i. e.* his younger daughter *Louisa von Linné*, who although about eighty years of age was still cheerful and in good health. Old persons testified that her features exceedingly resembled those of her immortal father. She gave her visitors the key of the rural dwelling which was the favourite retreat of Linnæus. The road to this place runs through the well-known King's Meadow, mentioned in the works of Linnæus, which was yet completely covered with the varied shades of the purple *fritillaria*. Three colours generally predominated here; bluish purple, pale red, and white. M. Pontin dug up a considerable number of all the varieties of these bulbs to plant in his own garden; with the exception of these flowers, the whole neighbourhood is bare and free of wood. No trees surround the farm-houses, and still less is there any appearance of forest cultivation on a larger scale; although, for several hundred years, both the government and private individuals have encouraged the inhabitants to plant. This proves how much is still wanting for the comfort of the inhabitants of this flat district, and also, that the means are yet to be devised how this useful shelter can be forced upon them.

After leaving the King's Meadow, the party passed through a bare plain to Hammarby, where they first saw a few trees growing here and there in a wild state, and some scattered plantations. The neighbourhood did not possess many rural charms. A turgid stream runs so deep as to be unseen between the fields. The King's Meadow affords the only beautiful view that can be obtained from this place of the castle and towers of Upsal. The building containing Linnæus's dwelling-house consists of two houses, and is situated on the south, at the foot of a stony height, surrounded by large rocks, as if an earthquake had thrown the granite rocks around it. It was only here and there that a tree could find space enough to spring up among these rocky ruins; and yet the lecture-room of Linnæus, so well known to the world, is found at the summit of a majestic uptowering pyramid, formed of them. There are two plantations near the house, which are more or less in a ruinous state.

The court-yard of the house is covered with grass. At each side of the door are two large rhamnuses, planted probably in the time of Linnæus. There is also a sweet chestnut, which has widely extended its branches over the entrance of one of the dwelling-houses; it has two supports, which give it the appearance of an old man leaning on crutches. This tree was planted by Linnæus himself, as his handwriting testifies.

The dwelling-houses consist of two wooden buildings, each two stories high; one of which. built like a wing, is inhabited. The other, which appeared to have been occupied by Linnæus and his family, was closed, and the ground was covered with tall grass as far as the steps; a proof how seldom the dwelling is visited. On account of some unknown family arrangements made by the descendants of Linnæus, this house has never been occupied since his decease. It consists of a dwelling which contained all the comforts of wealth, and which, with its furniture, has remained undisturbed for the space of fifty years. The sensations experienced by M. Pontin on entering this house, may, he thinks, be compared to those felt on crossing the threshold to the atrium of a newly-excavated house in Pompeii. All the surrounding objects were relics and recollections of bygone times, consecrated in a sanctuary for future generations. Over the entrance of the parlour, on the ground floor, was placed the expressive inscription, '*Dum faveat Cœlum*,'—' While it pleases Heaven.'

This apartment seemed to have been intended for daily use: it contained two indifferently painted likenesses of Linnæus, and portraits in crayons of his wife and four daughters. It was noticed, that among the numerous family pictures hanging on these walls, the portrait of his son and successor, Professor Charles von Linné the younger, is wanting. The upper apartment is in the same state as it was left on the death of Linnæus. Furniture, which perhaps was in fashion more than a hundred years back, ornaments and different kinds of household articles, all in the fashion of bygone times, are in the same places in which Linnæus left them. The walls of two apartments were covered with folio plates from botanical works. Over the door of the outer apartment is the sentence, '*Innocue viventes Numen ad est*,'—' Living harmlessly in the sight of God.' There were also various likenesses of Linnæus in oil (one of which had the inscription, '*Effigiei similis*'), in copper-engraving, silhouettes, and wax. There were also cameo likenesses of Banks and Solander. There were tea- and coffee-services, vases, &c., of china-ware, from the East Indies, ornamented with painted shoots of the Linnæa borealis. On small pedestals in the corner of the room stood mythological figures in alabaster, very much gilt, and of tolerable workmanship. Linnæus's academical hat, pretty much worn, yet in good preservation, lay on a table. It was made of green silk stuff, turned up on three sides, and ornamented with bows of red ribbon at the corners. M. Pontin suggests that this may be the identical hat worn by Linnæus at his promotion in Harderwyk in Holland; and remembers hearing, that sometimes when Linnæus was promoter in Upsal, the young doctors wore hats of these lively colours. The interior room contained the bed of Linnæus, with very rich silk curtains from the East Indies, on which were stamped representations of flowers. The coat of arms of Linnæus hung over the door of the third room. Articles of furniture, chairs with backs as high as a man, sofas in the same taste, and tables with tortuous feet, were found in all the rooms, and of the same antiquity. A spacious dining-room occupied nearly the half of the house; the staircase was also more convenient than was usual at that time in small wooden houses. Probably Linnæus built this house entirely according to his own taste, which may be confirmed from what he wrote in his notes in the year 1762:—'Linnæus built a house at Hammarby, so that the children might have a place of abode, as he felt himself growing weak.'

On the highest point of the rock before mentioned stands the Linnæan Museum of Natural History, established in 1768: it is a four-cornered stone building, one story high, with windows on three sides, and a four-cornered pointed roof not unlike that of a small chapel. A somewhat beaten path led to it between young firs; a proof that in the time of Linnæus few trees stood on that place. The Linnæan arms, painted on porcelain, are built in the wall over the entrance.

It was here that Linnæus deposited his valuable collection of every department of natural history, called by himself Museum Hammarbyense. It was also an auditorium, in which, during the academical vacations, he delivered lectures eight hours every day, and communicated his most important discoveries to a select audience, who lodged with the neighbouring peasantry, so as to be always present at these lectures, which were venerated as the sayings of an oracle. Here he received many learned men from other countries, and Mæcenases from all Europe. Amongst these, Linnæus himself mentions Lord Baltimore, a naturalist, and another, who, on his departure, presented him with a golden snuff-box weighing a hundred ducats; but, as he did not think his gratitude sufficiently manifested by this present, he afterwards sent him the sum of eight hundred ducats. At the time of M. Pontin's visit, the objects of natural history were no longer found in this museum, but the chair, and a three-legged tressel, with a board attached to the top for writing on, still stood there, surrounded by the benches for the audience.

This chair, says M. Pontin, once of greater consequence than the three-footed Delphic chair, was the throne of the mighty Prince of Nature, from which he governed the flowers of the world, according to the laws he had himself enacted; these he never trespassed, and in their fundamental principles they do not require improvement or alteration.

On descending from the height, the party visited a small level terrace between rocks. It was occupied by a moderately large larch-tree, probably planted in the time of Linnæus, when this tree was rare in Sweden. A pleasure-ground was laid out near the dwelling-house, in which, although now in a wild state, traces are still visible of regular plantations, paths, and bowers. A number of memorial-tablets direct the attention of the visitor to every tree that Linnæus had planted, and to those seats on which he reposed with most pleasure. A circle of poplars, a hedge of rhamnuses, and some plants of acer pseudo-platanus, were the only remaining traces of their long-departed planter. Probably this was the spot which Linnæus called his Siberian garden at Hammarby, and where he mentions that he cultivated five hundred kinds of seeds sent him by the Empress of Russia. The high grass was intermixed with the beautiful fumaria nobilis, growing completely wild here. There were also seen the anemone ranunculöides, and several other plants rare in this country.

The reform of the descriptive part of botany was one of the tasks first attempted by Linnæus; and his *Terminology*, or System of *Terms* employed in the description of objects of natural history, was the instrument by which his other improvements were effected.

'Though most readers,' says Professor Whewell, 'probably entertain, at first, a persuasion that a writer ought to content himself with the use of common words in their common sense, and feel a repugnance to technical terms and arbitrary rules of phraseology, as pedantic and troublesome; it is soon found, by the student of any branch of science, that, without technical terms and fixed rules, there can be no certain or progressive knowledge. The loose and infantine grasp of common language cannot hold objects steadily enough for scientific examination, or lift them from one stage of generalisation to another. They must be secured by the rigid mechanism of a scientific phraseology. This necessity had been felt in all the sciences from the earliest periods of their progress. But the conviction had never been acted upon so as to produce a distinct and adequate descriptive botanical language. To give an account of such a terminology, is, in fact, to give a description of a dictionary and grammar. Linnæus's work (*Fundamenta Botanica*) contains about a thousand terms, of which the meaning and application are distinctly explained; and rules are given by which in the use of such terms the botanist may avoid all obscurity, ambiguity, unnecessary prolixity and complexity, and even inelegance and barbarism. Although the rules which he gives are often apparently arbitrary and needless; yet in practice they are found to be of great service by their fixity and connexion. By the good fortune of having had a teacher with so much delicacy of taste as Linnæus, in a situation of so much influence, botany possesses a descriptive language which will long stand as a model for all other subjects.'

This language is the botanist's most familiar tongue; he even learns to *think* in it, and it is felt to be a useful implement, not an oppressive burden. It is only the schoolboy that complains of the irksomeness of his grammar and vocabulary. The accomplished student possesses them without effort or inconvenience.

The construction of a botanical grammar and vocabulary undoubtedly implies an extensive and accurate acquaintance with the facts of nature. ‘It is true that a person might construct an arbitrary scheme of distinctions and appellations, with no attention to natural objects; and this is what shallow and self-confident persons often set about doing in some branch of knowledge with which they are imperfectly acquainted. But the slightest attempt to use such a phraseology leads to confusion; and any continued use of it leads to its demolition. Like a garment which does not fit us, if we attempt to work in it we tear it to pieces.’

The *nomenclature*, or collection of the *names* of *species*, was the result of immense labour. ‘In order that I might make myself acquainted with the species of plants,’ says Linnæus in the preface to his work upon them, ‘I have explored the alps of Lapland, the whole of Sweden, a part of Norway, Denmark, Germany, Belgium, England, France: I have examined the botanical gardens of Paris, Oxford, Chelsea, Harlecamp, Leyden, Utrecht, Amsterdam, Upsal, and others: I have turned over the Herbals of Benser, Hermann, Cliffort, Burmann, Oldenland, Gronovius, Royer, Sloane, Sherard, Bobart, Miller, Tournefort, Vaillant, Jussieu, Surian, Beck, Brown, &c.: my dear disciples have gone to distant lands, and sent me plants from thence; Kerlen to Canada, Hasselquist to Egypt, Asbech to China, Toren to Surat, Solander to England, Alstræmer to Southern Europe, Martin to Spitzbergen, Pontin to Malabar, Kœhler to Italy, Forskähl to the East, Læfling to Spain, Montin to Lapland: my botanical friends have sent me many seeds and dried plants from various countries: Lagerström many from the East Indies; Gronovius most of the Virginian; Gmelin all the Siberian; Burmann those of the Cape.’ And in consistency with this habit of immense collection of materials, is his maxim, that ‘a person is a better botanist in proportion as he knows more species.’ ‘It will easily be seen,’ says Professor Whewell, ‘that this maxim, like Newton’s declaration, that discovery requires only patient thought, refers only to the exertions of which the man of genius is conscious, and leaves out of sight his peculiar endowments, which he does not see, because they are part of his power of vision. With the taste for symmetry which dictated the *Critica Botanica*, and the talent for classification which appear in the *Genera Plantarum* and the *Systema Naturæ*, a person must undoubtedly rise to higher steps of classificatory knowledge and skill, as he became acquainted with a greater number of facts.'

With respect to the artificial system of arranging plants pursued by Linnæus, we have seen that, from the time of Cæsalpinus, botanists had been attempting to form a systematic arrangement. All such arrangements were necessarily both artificial and natural; they were artificial, inasmuch as they depended upon assumed principles, the number, form, and position of certain parts, by the application of which the whole vegetable kingdom was imperatively subdivided; they were natural, inasmuch as the justification of this division was, that it brought together those plants which were naturally related. No system of arrangement, for instance, would have been tolerated which separated into distant parts of the plan the different species of the same genus. Let it be remembered, then, that as far as the genera, at least, *all* systems are natural.

But beginning from this point, systems may be constructed with two opposite purposes, according as an assumed principle of division is rigorously and consistently carried through the system, or as natural families of a wider kind than genera are associated together. The former propensity leads to an *artificial*, the latter to a *natural* method.

The strongest recommendation of an artificial system (besides its approaching to a natural method) is, that it shall be capable of easy use; for which purpose the facts on which it depends must be apparent in their relations, and universal in their occurrence. The system of Linnæus founded upon the number, position, and other circumstances of the stamens and pistils, the reproductive organs of the plant, possessed this merit in an eminent degree as far as these characters are concerned; that is, as far as the *classes* and *orders*. In its further subdivision into genera its superiority was mainly due to the exact observation and description which we have already had to notice as talents which Linnæus peculiarly possessed.

The sole aim of the Linnæan artificial system is to help any one to learn the name and history of an unknown plant in the most easy and certain manner, by first determining its class and order,—and then making out its genus by comparing the parts of fructification with all the generic characters of that order, and finally its species, by examining all the specific definitions of the genus.

The Classes in this system are twenty-four in number, and their distinctions are founded on the number, situation, or proportion of the stamens. The names assigned to these classes are of Greek derivation, and express their several distinctions.

The Orders are founded, for the most part, on the number of the pistils.

# CHAPTER III.

## JUSSIEU AND THE NATURAL SYSTEM OF BOTANY.

On the Formation of a Natural System—Conditions necessary thereto—Principles of Gærtner and Adanson—Biographical Sketch of Adanson—His Birth, Parentage, and Education—Visits Africa—Publishes Natural History of Senegal—Notice of this Work—Publishes the *Familles des Plantes*—Notice thereof—His Scheme for an Encyclopædia—His Misfortunes—Illness and Death—Jussieu—His Birth and Education—Becomes Demonstrator of Botany at the age of twenty-two—His Memoir on the Order Ranunculaceæ—His Memoir on a Natural System of Classification—Objects of this System—Merit of its Formation partly due to his Uncle Bernard—MSS. Catalogues of Bernard—Jussieu publishes the *Genera Plantarum*—Notice of this Work—Its Reception—Character of Jussieu—His Death—Remarks on the Natural System—Lamarck—De Candolle—Reception of the System in England—Roscoe—Salisbury—Robert Brown.

THE formation of a natural system of classification must result from a close attention not to one or two, but to *all* the parts of plants. This was Linnæus's own definition, and has been admitted by succeeding botanists. Yet the great naturalist seems to recognise a particular instinct, as it were, by which botanists are guided in their inquiries, and which enables them to distinguish the characters of plants. 'The habit of a plant,' he remarks, 'must be secretly consulted. A practised botanist will distinguish at the first glance plants of different quarters of the globe, and yet will be at a loss to tell by what mark he detects them. There is, I know not why, a sinister, dry, obscure look in African plants; superb and elevated in the Asiatic; smooth and cheerful in the American; stunted and indurated in the Alpine.'

The earlier systems of plants, as far as they went, were natural; and they only ceased to be so when it appeared that an artificial system might be made to answer a very useful purpose to the science, while the problem of devising a *complete* natural system remained insoluble. Yet botanists did not renounce the highest object of their science. In France, especially, a succession of extraordinary men laboured at it with no inconsiderable success; and they were seconded by worthy fellow-labourers in Germany and elsewhere.

'The precept of taking into account all the parts of plants according to their importance, may be applied according to arbitrary rules. We may, for instance, assume that the fruit is the most important part; or we may make a long list of parts, and look for agreement in the greatest possible number of these, in order to construct our natural orders.' The former course was followed by Gærtner; the latter by Adanson. Gærtner's principles, deduced from the dissection of more than a thousand kinds of fruits, exercised, in the sequel, a great and permament influence on the formation of natural classes. The name of Adanson is so intimately connected with the natural method, that a slight sketch of the life of this remarkable man may perhaps be found interesting.

Michael Adanson was born at Aix, in Provence, in April 1727. His forefathers were natives of Scotland, and had quitted that country in consequence of the troubles which distracted it at the beginning of the eighteenth century. His father was engaged as equerry to Vintimille, archbishop of Provence, who being translated to the see of Paris, Michael was taken thither in his infancy. At the age of seven he received an appointment from the archbishop to the canonry at Champeau de Brie, which paid the expences of his education at the college of Plessis. He was admitted to attend the lectures of Bernard de Jussieu and Reaumur, to whose cabinets he had free access, and in which he spent whole days in the study of the objects they contained. When he was only fourteen he had particularly directed his attention to the classification of natural objects, and was meditating over three systems for the arrangement of plants. When he was nineteen he had accumulated descriptions of four thousand objects in natural history, involving a great amount of labour. Being small in stature, and appearing much younger than he really was, many jokes were passed upon him when he carried off the academical prizes. On one of these occasions, Needham, the well known microscopic observer, presented him with a microscope accompanied with these remarkable words: 'Young man, you have studied enough of books; your future path will be among the works of nature, not of man.' From this time he studied natural history with uncommon ardour. His parents had intended him for the church, but such was his thirst for natural science, that he determined to travel into distant lands which, as yet, had been unvisited and undescribed by naturalists.

He soon had an opportunity of visiting Africa, although at the expense of a large portion of his fortune. The natural history of this vast continent was then almost unknown; and therefore offered a fine field for the observing eye of our young adventurer. In 1748, and at the age of twenty-one, he embarked, and after visiting the Azores and the Canaries, landed on the island of Goree, on the coast of Senegal, where he made a vast collection of specimens, animal, vegetable, and mineral, which he classified and described. He extended his researches also to the climate, geography, language, and manners of the people. His reasons for selecting Senegal are characteristic of the man. He preferred it, he declared, 'because it was, of all European establishments, the most difficult to penetrate; the hottest, the most unhealthy, and in other respects the most dangerous, and consequently the least known to naturalists.' 'Adanson,' says Dr. Lankester, 'was for five years exposed to the burning sun, the drenching rains, and unwholesome atmosphere of Senegambia; but during all this period he was incessantly at work. He collected and described an immense number of new plants and animals; he made a map of the rivers Senegal and Gambia, prepared dictionaries and grammars of the languages of the people on their banks, kept a register of meteorological observation, made many times during the day; composed a treatise on all the useful plants of the country; collected objects of commerce, clothes, utensils, and instruments of war of the inhabitants, and having thus gratified his passion for studying nature, returned to Europe in February 1754, rich in knowledge, but greatly impoverished in fortune.' Four years afterwards he published his *Natural History of Senegal*, a work abounding in original views and practical information. This work contains the first attempt on record of classifying shells according to the animals they contain, instead of their mere external forms. The views which Adanson had really formed of the insufficiency of the classifications in natural history then accepted in Europe, were confirmed by his researches in Africa. He saw that however easy and complete the systems of Tournefort and Linnæus might appear to those who were acquainted with the European flora only, they were both essentially defective when applied to the more extensive vegetation of tropical climes. The system of Linnæus, founded on the reproductive organs, seemed to him to be incomplete. The objections to the method of Tournefort were less numerous; and he therefore decided to take Tournefort's method as a basis upon which to erect a classification of his own. His pecuniary difficulties would probably have suspended his studies, but for the generous encouragement of M. Bombarde, a zealous patron of science, by whose aid Adanson was enabled to publish, in 1763, his *Familles des Plantes*. In this work Adanson insisted on the necessity of a system which should be so far in accordance with nature, that all those objects which most resemble each other may be classed together. The method which he followed is thus described by his eloquent and philosophical eulogist Cuvier.

Considering each organ by itself, he formed, by pursuing its varions modifications, a system of division, in which he arranged all known species according to that

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organ alone. Doing the same for another organ, and another, and so for many, he constructed a collection of systems of arrangement, each artificial,—each founded upon one assumed organ. The species which come together in all these systems are, of all, naturally the nearest to each other; those which are separated in a few of the systems, but contiguous in the greatest number, are naturally near to each other, though less near than the former; those which are separated in a greater number, are further removed from each other in nature; and they are the more removed, the fewer are the systems in which they are associated.

Thus, by this method the means are obtained of estimating precisely the degree of natural affinity of all the species which our systems include, independent of a physiological knowledge of the influence of the organs. But the method has the inconvenience of presupposing another kind of knowledge, which, though it belongs only to descriptive natural history, is no less difficult to obtain;—the knowledge, namely, of all species, and of all the organs of each. A single one neglected, may lead to relations the most false; and Adanson himself, in spite of the immense number of his observations, exemplifies this in some instances.

It has been remarked, that Adanson's work 'no doubt furnished many important suggestions to Jussieu in the construction of his system; and it is to this day consulted by those who make the philosophy of botany their study. Unfortunately for its author, and still more for science, his views were more advanced than those of his contemporaries; his perceptions of botanical truths, however just, were of a nature not to be valued by those who had less experience or acuteness than himself; he also attempted to introduce a barbarous nomenclature, which, it must be confessed, was at variance with common sense; and, what was worse than all, he had unceremoniously rejected that system of Linnæus which had become the basis of the botanical creed of almost all Europe.'

About five years after the publication of his *Familles des Plantes*, Adanson determined to publish a new edition, and had made the necessary corrections and many additions, when he formed the plan of a vast work, far beyond the strength and the lot of man, but which he conceived himself able to execute. This was an Encyclopædia of Natural History, to contain forty thousand figures. Up to the period of the French Revolution, he was chiefly occupied in collecting materials for his stupendous undertaking; and in making experiments in vegetable physiology. He also contributed some botanical articles to the Supplement of the French Encyclopædia. He now shared in the ruin which the revolution brought upon his country; the little remnant of his fortune was destroyed; he had the grief of seeing his plantations of mulberry trees, which had long been the object of his zealous attention, and which consisted of one hundred and thirty varieties, destroyed by a brutal mob. He became so destitute, that upon the re-establishment of the Institute of France some years after, being invited to attend a meeting of its earliest members, he could not accept the invitation for want of shoes. The minister of the interior however procured him a pension, on which he subsisted until his death, which occurred in 1806, after a painful and distressing illness[1]. He left behind him an immense number of manuscripts; and almost to the last moment of his life cherished the hope of finishing his great encyclopædia.

It was his dying request that there should be no memorial to point out his grave, except a garland composed of flowers from the fifty-eight families of plants which he had established.

Cuvier's character of him is this: 'Indomitable courage, infinite patience, an unpleasing eccentricity, ardent desire for a speedy reputation, and a disdain for the means which would procure it, calmness in the midst of all kinds of privations and sufferings, were the characteristics of his mind.'

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[1] In 1756, soon after his return from Senegal, Adanson read a paper to the Academy of Sciences, on the Baobab Tree (*Adansonia digitata*). This enormous tree is subject to a disease, which may be compared to the very malady of which its discoverer died—viz. a softening of the bones. In the tree all the hard parts sometimes soften, so that it becomes dismembered or overthrown by the first storm that occurs after the disease has set in.

Contemporary with Adanson, was the celebrated Jussieu, whose name is more intimately connected than that of any other botanist with the history of the natural system. 'His natural method,' says Cuvier, 'forms perhaps as important an epoch in the sciences of observation, as the *Chimie* of Lavoisier does in the sciences of experiment.'

Antoine Laurent de Jussieu was born at Lyons, in 1748. In 1765, when he had just completed his classical studies in his native city, his uncle, Bernard de Jussieu, a man possessing a profound knowledge of plants, invited him to Paris in order to assist and direct his studies. The first four years of sojourn at Paris were devoted to the study of medicine, in which botany was considered only an accessory science. This uncle, who was one of the demonstrators of botany in the Jardin du Roi, designed him to fill the office of botanical lecturer, rendered vacant by the absence of Lemonnier, who, as first physician to the king, had been called away to Versailles.

At the early age of twenty-two Antoine was nominated to this office of demonstrator. His duty was to teach to the pupils the essential characters of the plants which were classed in the garden after the method of Tournefort, and being thus engaged in imparting knowledge on a subject which till then had been but incidentally connected with his studies, he was obliged to devote the night to the acquisition of that knowledge which he was to impart on the following day. Nevertheless, a place having become vacant in the Academy of Sciences, in 1773, Jussieu presented himself as a candidate, and supported his pretensions by a memoir on the natural order *Ranunculaceæ*, which was printed in the Transactions of the society. He was wont to relate in after life (as his son tells us) that the research and intense application required for the production of this memoir, first opened his eyes, and made him a botanist. In this memoir he explained fully the relative importance of the characters of plants, and the subordination of some to others; an essential consideration which Adanson's scheme had failed to take account of. From this time the investigation of the conditions necessary to a natural system of classification occupied all the labours of Jussieu; and in 1774, when he became urgent to re-establish, on a larger basis, the botanic garden, and to replace the old and insufficient classification of Tournefort by a new one, he occupied himself in arranging the plants according to a new method, the principles of which he developed in a memoir read to the Academy of Sciences in 1774, and afterwards carried into effect in the garden.

The classes which were formed by the Jussieus, though they have since been modified by succeeding writers, have been so far retained by the most profound botanists, notwithstanding all the new care and new light which have been bestowed upon the subject, as to shew that what was done at first, was a real and important step in the solution of the problem.

The merit of forming the new method of plants must be divided between the two Jussieus. It has been common to speak of the nephew, Antoine, as only the publisher of his uncle's work. But this appears, from the statement of Adrien de Jussieu, the son of Antoine, to be highly unjust. Bernard left nothing in writing but the catalogues of the garden of the Trianon, which he had arranged according to his own views; but these catalogues consist merely of a series of names without explanation or reason added. The uncle died in 1777, and his nephew, in speaking of him, compares his arrangement to the *ordines naturales* of Linnæus: 'Both these authors,' he says, 'have satisfied themselves with giving a catalogue of genera which approach each other in different points, without explaining the motives which induced them to place one order before another, or to arrange a genus under a certain order. These two arrangements may be conceived as problems, which their authors have left for botanists to solve. Linnæus published his; that of M. de Jussieu is known only by the manuscript catalogues of the garden of the Trianon.'

It was not till the younger Jussieu had employed himself for nineteen years upon botany, that he published, in 1789, his *Genera Plantarum secundum Ordines Naturales disposita.* It is easy to follow in the numerous manuscripts which he has left behind him, and which his son preserves with religious care, the successive steps which he took in this classification; it is equally easy to see that the starting point from which his labours proceeded was his uncle's catalogues of the garden of the Trianon; and, however incredible the assertion may appear, it is nevertheless true, that the *Genera Plantarum* was written wholly from memory; and he had so entirely formed his scheme in his head, that he began the impression without having written the book, and the manuscript was never more than two pages in advance of the printer's type. 'What is it,' exclaims his son, 'that is most admired in this work? not so much the systematical key, which has been so often attacked and abandoned by modern writers, as the admirable sagacity which regulated all the details. It is the neatness of the characters, the happy employment of such as had been previously neglected, and the correct estimate of their value, the prodigality with which notes full of deep knowledge and fruitful in new ideas are dispersed throughout the work, the endless questions and doubts, which show how much the author had meditated upon his subject, and that he was among the first to regret the sacrifices he was compelled to make to the necessity of a systematic arrangement; and finally, that instinct, so true to natural affinities, which made him so often suspect the truth when he could not establish it.'

This valuable work was received almost with indifference; for the unsettled state of Europe left men little leisure to attend to the advancement of science. The author himself became occupied with public affairs, and seems for some years to have forgotten his book. Accordingly his views made their way slowly, and with difficulty, even in France, where botanists had, shortly before, been so eager in pursuit of a natural system; while in England and Germany, where the Linnæan system was so readily adopted, its progress was yet more slow.

In the year 1790, Jussieu was named member of the municipality of Paris, and was charged with the superintendence of the hospitals and charities of the city. In 1793, the Jardin du Roi was re-organized under the new name of Jardin des Plantes, and Jussieu became professor of rural botany. He was afterwards appointed director and treasurer of the Museum of Natural History, and in 1802 resumed his botanical writings. His memoirs, amounting to fifteen in number, upon his own natural orders of plants, were published in the *Annales du Museum*, up to the year 1820, when he became lost to science. He was then in his seventy-second year, and became deaf and almost blind. His firm religious principles and natural fortitude sustained him under the weight of these afflictions. One of his biographers, speaking of him at a later period, says, 'It was a fine spectacle to see this noble wreck, at the age of nearly ninety, condemned to almost absolute isolation by the loss of his external senses, still making the most ingenious efforts to maintain an intercourse with the world, and to occupy his indefatigable mind. Prayer and meditation occupied much of his closing life: from time to time, science, which he had always loved, returned to his thoughts, and resumed its empire over him; and at such times his thoughts were uttered with great animation; his studies and researches recurred to his mind with all their original energy and lucidity; and all who listened to him admired the wonderful tenacity of his memory.'

The history of the private life of this celebrated man is of the most simple kind. He never quitted France, and all his travels were bounded on one side by Lyons, and on the other by Paris. Nearly the whole of his time was passed in the Jardin des Plantes and the Cabinet de Botanique. The results of his scientific labours, abandoned to themselves when terminated, worked their own way in the scientific world; and he was never known to defend his doctrines by the armour of polemical discussion. 'Scientific doctrines,' he was accustomed to say, 'are either good for something or for nothing; in the one case they have no need of defence, and in the other they ought not to be defended.' He died after a short illness, on the 13th of September, 1836, leaving his son Adrien his successor in the chair of botany, and the inheritor of his father's virtue and talents.

We will now offer a few remarks on the natural system. The natural method, as propounded by Jussieu, has in view not the mere naming of plants, but the classifying them according to the resemblance that one tribe of plants bears to another. In order to do this, it was necessary to discover the relative importance of the different organs in plants. Some are found to be so variable even in the same species, that little dependence is to be placed upon them; others, on the contrary, are more constant, and afford better ground for classification. To illustrate this, we have only to sow a quantity of seed of the same plant, and watch it as it comes up. There will be scarcely two individuals among these plants that will *exactly* agree in the shape of the leaves or the height of the stem; thus plainly showing that characters derived from the stem and leaf are of the least importance, and to be employed with caution. There will be sufficient resemblance to convince any one acquainted with plants that they all belong to the same species, but this is all. When we take several species and compare them together, we find so great a variety in the stem and leaves that we look for characters elsewhere, and resort to the different parts of the flower. All genera, therefore, are founded on the consideration of the parts of the flower. An attentive examination of the various flowers of a genus will, however, prove that these also are, to a certain extent, variable, some species differing from others in the number or shape of the sepals or petals, or stamens or pistils. It is also noticeable, that the sepals are less constant than the petals, and the petals less constant than the stamens; which fact influenced Linnæus in some measure when he made the stamens and pistils, as being the most constant, the basis of his system of classification. Now as the outer portions were successively less constant than those which they enveloped, the natural system goes still farther than the stamens and pistils, and penetrates to the *seed*. The external appearance of the seed is indeed subject to great diversity, but if the interior is examined, particularly the embryo, or very rudiment of the plant, it becomes apparent that there are only two modifications, and on opening a great number of seeds, each of these modifications is found to be constant to a very extensive class of plants united together, whether by the structure of the fruit, the number of the stamens, the parts of the flower, the anatomy of the stems or the leaves.

Linnæus himself foresaw that these modifications of the embryo must form the groundwork of a natural system ; and what he foresaw Jussieu demonstrated and brought into practice. These remarks are, of course, only applicable to plants in which a seed and embryo exists. The primary division of plants is into those that have flowers, and those that have none, or rather, into those which have seeds and an embryo, and those which have neither true seeds nor embryo.

We have now to notice the modifications of the embryo in flowering plants. We have just said that all seeds are found subject to two modifications. These are,—first, those in which the embryo or rudiment of the future plant is contained in a single lobe or cotyledon ; secondly, those in which it is enclosed by two opposite lobes or cotyledons.

Thus are established important primary divisions with constant characters. In arranging these in orders there was more difficulty, although it was quite possible to group genera into orders, and place the orders under one or the other of these primary divisions ; yet it is acknowledged to be almost impracticable to place the orders satisfactorily one after another in regular rotation. The reason for this is, that each order is not only related to the one we place before it and the one which comes after it, but it approaches more or less to several others. Therefore all that can be attempted in arranging the orders in a lineal series is to place those next each other which have common characters, of most value, or of greatest number; and this arrangement must still remain subject to daily changes, as the discovery of new plants, or a more perfect knowledge of those already discovered, may render such changes necessary. This it is which renders the natural system difficult as compared with an artificial one; 'but these difficulties are from time to time smoothed down, so that ultimately it will be viewed as the only useful one, while the artificial system will be entirely neglected, except by those whose desires extend no farther than to make out the name of a vegetable.'

Jussieu arranged plants into fifteen classes, to which he at first gave no names, and the want of names was much felt. Antoine L. de Jussieu has since given them the formidable-looking names by which they are now distinguished; but which a little attention convinces us to be of great utility, since they point out the structure of each class.

The division of plants according to the cotyledons corresponds to a distinction in the general structure and organization of the plant; but it is only lately that this fact has been distinctly brought into view. Desfontaines discovered that the ligneous fibre is developed in an opposite manner in vegetables with one and with two cotyledons; towards the inside in the former case, and towards the outside in the latter; and hence these two great classes have been since termed *Endogenous* and *Exogenous*.

Yet even at this advanced stage of generalisation the best botanists perceive that *no one* character can be imperative for a natural method. Lamarck, who employed his great talents on botany, before he devoted himself exclusively to other branches of natural history, published his views concerning methods, systems, and characters. His main principle is, that no single part of a plant, however essential, can be a rule for classification; and hence he blames the Jussieuian method as giving too much authority to the cotyledons. Roscoe further urges, that some plants, as *Orchis morio*, and *Limodorum verecundum*, have no visible cotyledons. Yet De Candolle, who laboured along with Lamarck in the new edition of the *Flore Française*, has been led by the most careful application of the wisest principles to a system of natural orders, of which Jussieu's may be looked upon as the basis; and we find the greatest botanists, up to the most recent period, recognising and employing themselves in improving Jussieu's natural families. 'No real acquisition in science,' says Professor Whewell, 'is ever discarded.'

The reception of the system of Jussieu in this country was not so ready and cordial as of that of Linnæus. The two systems were regarded as rivals. Thus Roscoe, in 1810, endeavoured to shew that Jussieu's system was not more natural than the Linnæan, and was inferior as an artificial system. In 1803, Salisbury had already assailed the machinery of the system, but with great expressions of respect for the author. But the more profound botanists of England soon showed that they could appreciate and extend the natural method. Robert Brown, who had accompanied Captain Flinders to New Holland in 1801, and who, after examining that country, brought home, in 1805, nearly four thousand species of plants, was the most distinguished example of this. In his preface to the *Prodromus Floræ Novæ Hollandiæ*, he says that he found himself under the necessity of employing the natural method, as the only way of avoiding serious error, when he had to deal with so many new genera as occur in New Holland; and that he has therefore followed the method of Jussieu; the greater part of whose orders are truly natural, 'although their arrangement in classes, as is,' he says 'conceded by their author, no less candid than learned, is often artificial; and, as it appears to me, rests on doubtful grounds.'

The reader will therefore see what an extensive and exact knowledge of the vegetable world, and what comprehensive views of affinity, must be requisite in a person who has to modify the natural system, so as to make it suited to receive and arrange a great number of new plants, extremely different from the genera on which the arrangement was first formed, as the New Holland genera for the most part were. He will see also how impossible it must be to convey by extract or description any notion of the nature of these modifications: it is enough to say, that they have excited the applause of botanists wherever the science is studied, and that they have induced Humboldt and his fellow-labourers, themselves botanists of the first rank, to dedicate one of their works to him in terms of the strongest admiration. Mr. Brown has also published special disquisitions on particular portions of the natural system.

We cannot close this botanical sketch without some more extended notice of De Candolle. The following biographical memoir of that distinguished individual was read by Dr. Roget, at the anniversary meeting of the Royal Society in 1841.

Augustin Pyramus de Candolle was born at Geneva on the 4th of February, 1778. The same year is also memorable by the death of Linnæus, which took place about three weeks before the birth of one who was destined to emulate his fame in the same department of natural history. When seven years of age De Candolle sustained a serious attack of hydrocephalus, a disease generally so fatal in its tendency, that the present affords a remarkable instance of complete recovery after life had been for many days despaired of. Possessing a remarkable facility of writing verses both in French and Latin, and having at the same time a keen relish for the study of history, young De Candolle at first resolved to make literature his profession; aspiring, as the summit of his ambition, to the fame of being a great historian. But this dream of his youth was effaced by a new taste, imbibed during a residence in the country, where he amused himself with examining the plants of the neighbourhood, and with writing their descriptions, before he had even opened a single book on botany. The few pages he there read of the volume of nature were sufficient to captivate his affections for the pursuit which henceforth became the dominant passion of his life. The botanical lectures of Professor Vaucher, which he attended in 1794, increased his ardour, and confirmed him in the resolution he had formed of devoting himself to the cultivation of botany as his primary object, to which all other sciences, as well as branches of literature, were hereafter to be deemed subordinate, and to be followed merely as recreations from severer study. A visit to Paris, which he made in 1795, gave him the opportunity of attending the lectures of Cuvier, Fourcroy, Vauquelin, and other distinguished professors of that period, and of forming friendships with Desfontaines and Lamarck. He always prided himself in having been the pupil of Desfontaines in particular, towards whom he continued through life to feel the warmest gratitude and affection.

The establishment of the Society of Physics and Natural History at Geneva, which took place after his return under the auspices of the celebrated De Saussure, gave a fresh and powerful impulse to his exertions, as was evinced by the numerous memoirs which he presented to that society.

The state of Geneva being soon after this period absorbed into the French empire, De Candolle was induced to quit that city, and attend the medical lectures in Paris; a course of study which, tending to enlarge his views of the physiology of organized beings, contributed greatly to the success with which he afterwards cultivated the philosophy of botany. While at Paris he founded, in conjunction with his friend, M. Benjamin Delessert, the Société Philanthropique. One of the first advantages resulting to the public from this institution was the distribution of economical soups throughout the different quarters of the city. Of this institution he was the active secretary for ten years; during which period another society was also formed under his direction and management, for the encouragement of national industry. In 1804 he gave lectures on vegetable physiology, at the Collége de France, and published an outline of his course in 1805, in the *Principes de Botanique*, prefixed to the *Flore Française*.

In 1806 he was commissioned by the French government to collect information on botany, and the state of agriculture through the whole of the French empire; the limits of which, at that time, extended beyond Hamburgh to the north, and beyond Rome to the south. Every year, during the following six years, he took a long journey in fulfilment of the task assigned him, and drew up a report of his observations for the minister. In these annual reports, however, he did not confine himself to the special objects of his commission, but made known his views with regard to the internal administrations of the countries he visited, suggesting, at the same time, measures for their amelioration, and for the correction of existing abuses. He had projected a great work on the agricultural state of the empire, and had even executed considerable portions of it, comprehending the French Flora, arranged according to modern views of classification, when the political events of 1814 put an entire stop to the work. In 1807 he was appointed professor of medicine at Montpellier; and in 1810 a chair of botany was instituted in the same academy, which he was invited to occupy. Under his superintendence the botanical garden of that city was more than doubled in extent, and the study of botany assumed a degree of importance it had never before possessed. De Candolle quitted Montpellier in 1816, very much to the regret of the students and of his colleagues, who employed every means in their power to induce him to remain among them; but his country had been restored to liberty, and he was firm in his determination to fix himself in his native city, and devote to its services the remainder of his days.

Soon after his return to Geneva he was appointed to the chair of natural history, an office which had been created expressly that he might occupy it. Among the first of the public benefits which he conferred upon his countrymen was the establishment of a botanic garden. The government of Geneva willingly lent their aid in forming so laudable an institution, in which he was also assisted by a great number of voluntary subscribers.

The enthusiasm which he inspired for his favourite science was remarkably displayed on one particular occasion, when, being desirous of procuring for Geneva a copy of a *Flora of Mexico* which had been deposited with him for a few days, an appeal which he made to the public was responded to with such alacrity, that in the course of eight days one thousand drawings had been finished by amateurs, who volunteered their services on the occasion.

The activity and powers of De Candolle's mind were displayed in a multitude of objects of public utility, the furtherance of which now called forth in him the most lively interest;—whether it was the improvement of agriculture, the cultivation of the fine arts, the advancement of public instruction, the diffusion of education, or the amelioration of the legislative code. Feeling deeply of what vast importance to the welfare of mankind it is that sound principles of political economy should be extensively promulgated and well understood by all ranks of men, De Candolle never failed to develope and enforce those principles in his lectures and popular discourses, as well as in his official agricultural reports. On these subjects, and especially with respect to the immense advantages which would accrue to the community from the unrestricted freedom of commerce, his views were those of the most enlightened policy, and exhibited a sagacity in advance of the times in which he lived.

As a lecturer he possessed in an eminent degree the power of imparting to his auditors the enthusiasm which glowed within his own breast for the pursuits of natural history. Complete master of the subject of his discourse, his ample stores of knowledge never failed to supply him with illustrations; and even in his extempore effusions all his ideas are developed in the clearest order and explained with singular perspicuity. His chief delight was to afford assistance of every kind to such students as needed it, and in whom he perceived a desire of improvement. His great aim was to inspire and diffuse a taste for the study of botany by rendering it popular among all ranks. His library, which contained the richest collection of works on that subject, and the volumes of his *Hortus Siccus*, were always open to those who wished to consult them. Often has he been known to discontinue researches which he had commenced, on finding that a similar design was entertained by another person; and he hastened, on these occasions, to communicate to this inquirer his own views on the subject, to place in his hands the materials he had collected, and to put him in possession of the fruits of his own experience. His sole object was the advance of knowledge; and whether this was effected by himself or by others, was to him a matter of total indifference.

De Candolle had been visibly declining in health for some years before his end. The sudden death of Cuvier had impressed him with the apprehension that a similar fate might be impending, and that he himself might, in like manner, be cut off before he had accomplished the great works in which he was then engaged. He, in consequence, resolved to set aside all other occupations, and concentrate all his efforts in completing those more important designs. During the last year of his life he undertook, with the vain hope of improving his strength, a long journey, in the course of which he attended the scientific meeting held at Turin, where, as might be expected, he met with the most flattering and cordial reception. His death took place on the 9th of September, 1841, in the sixty-fourth year of his age.

Having thus brought our very brief notice of botanists and their labours, nearly to the present time, it remains to state that no remarkable discoveries or changes have been made in the science of botany of late years, although abundant employment has been afforded to scientific men in working out those general principles which are now established and well understood, and in reducing to lucid order much that was irregular and apparently discordant in the vegetable kingdom. Steady and equal progress in this important science appears now to be making in England, France, and Germany.

# APPENDIX.

## ACCOUNT OF LINNÆUS'S JOURNEY TO LAPLAND.

It has been already stated, in the biographical notice of Linnæus, that the papers, herbarium, &c. of the great naturalist after his decease became by purchase the property of Sir James Edward Smith. Among these papers was discovered the original journal of Linnæus, kept by him during his tour in Lapland, and which had never been published. To the great disappointment of the possessor and his scientific friends, this journal was written in the Swedish language, and for a long time its curious and valuable contents remained unexplored. 'At length Mr. Charles Troilius, a young gentleman in the mercantile line, resident in London, undertook the task of translating it. The manuscript proved to be the identical journal written on the spot during the tour, which certainly rendered it the more interesting; but the difficulty of deciphering it proved, from that very circumstance, unexpectedly great. The bulk of the composition is Swedish, but so intermixed with Latin, even in half sentences, that the translator not being much acquainted with this language, found it necessary to leave frequent blanks, giving a literal version only of what he was able to read. The whole abounds also with frequent cyphers and abbreviations, sometimes referring to the publications or opinions of the day, and intended as memorandums for subsequent consideration. It is, in short, such a journal as a man would write for his own use, without the slighest thought of its ever being seen by any other person. The composition is extremely artless and unaffected, giving a most amiable idea of the writer's mind and temper; and it cannot but be considered as highly curious to contemplate in these pages the developement of such a mind as that of Lin-

'In this journal,' says the editor in his dedication to Mr. Foster, one of the fellows of the Linnæan Society, 'we behold not the awful preceptor of the learned world in his professional chair, but a youthful inexperienced student, full of ardour and curiosity, such as we ourselves have been, recording his ideas and observations for his own use—not delivering them forth for the instruction of others; and while we admire his perseverance and acuteness, we can sympathize with his embarrassments, and readily pardon his very inconsiderable mistakes. Happy are those who, like you, can equally sympathize in his pious and benevolent affections, his disdain of hypocrisy and oppression, and his never-ceasing desire to turn his scientific acquisitions to practical utility.'

## THE JOURNAL.

'Having been appointed by the Royal Academy of Sciences to travel through Lapland, for the purpose of investigating the three kingdoms of Nature in that country, I prepared my wearing apparel and other necessaries for the journey as follows:—

'My clothes consisted of a light coat of Westgothland linsey-wolsey cloth, without folds, lined with red shalloon, having small cuffs and collar of shag; leather breeches; a round wig; a green leather cap, and a pair of half-boots. I carried a small leather bag, half an ell in length, but somewhat less in breadth, furnished on one side with hooks and eyes, so that it could be opened and shut at pleasure. This bag contained one shirt; two pair of false sleeves; two half shirts; an inkstand, pen-case; microscope and spying-glass; a gauze cap to protect me occasionally from the gnats; a comb; my journal, and a parcel of paper stitched together for drying plants, both in folio; my manuscript *Ornithology*, *Flora Uplandica*, and *Characteres Generici*. I wore a hanger at my side, and carried a small fowling-piece, as well as an octangular stick, graduated for the purpose of measuring.'

Linnæus set out alone on the 12th May, 1732, from the city of Upsal. 'At this season Nature wore her most cheerful and delightful aspect, and Flora celebrated her nuptials with Phœbus.

> Spring clothes the fields and decks the flowery grove,
> And all creation glows with life and love.

Now the winter-corn was half a foot in height, and the barley had just shot out its blade. The birch, the elm, and the aspen-tree, began to put forth their leaves. * * The lark was my companion all the way, flying before me quivering in the air. The weather was warm and serene. Now and then a refreshing breeze sprang up from the west, and a rising cloud was observable in that quarter.'

About a mile and a quarter from Upsal our traveller reached Okstad. 'Here the forests began to thicken. The charming lark, which had till now attended my steps, here left me; but another bird welcomed my approach to the forest, the red-wing, whose amorous warblings from the tops of the spruce-fir were no less delightful. Its lofty and varied notes rival those of the nightingale herself. In the forest innumerable dwarf firs are to be seen, whose diminutive height bears no proportion to their thick trunks, their lowermost branches being on a level with the uppermost, and the leading shoot entirely wanting. It seems as if all the branches came from one centre like those of a palm, and that the top had been cut off. I attribute this to the soil, and could not but admire it as the pruning of nature.'

About a mile further on, at Läby, Linnæus found the red Spanish whortle-berry in blossom, and made a description of it. 'A large and dreary pine-forest next presented itself, in which the herbaceous plants seemed almost starved, and in their place the soil, which was hardly two inches deep, bearing heath and lichens; all below that depth being pure barren sand.'

The forest abounded with the yellow anemone, hepatica, and wood-sorrel. 'Their blossoms were all closed. Who has endowed plants with intelligence to shut themselves up at the approach of rain? Even when the weather changes in a moment from sunshine to rain, though before expanded, they immediately close. Here for the first time this season I heard the cuckoo, a welcome harbinger of summer.'

Linnæus went a little out of his way to look at the cataract of Elf Carleby. Its roar could be heard from the road, and the vapour of its foam was seen rising like the smoke of a chimney. 'On arriving at the spot I perceived the river to be divided into three channels by a huge rock, placed by the hand of nature in the middle of its course. The water in the nearest of these channels falls from a height of twelve or fifteen ells, so that its white foam and spray are thrown as high as two ells into the air, and the whole at a distance appears like a continual smoke. On this branch of the cascade stands a saw-mill; the man employed in it had a pallid countenance, but he did not complain of his situation so much as I should have expected.'

Linnæus found it impossible to examine the nature of the inaccessible black rock over which the water precipitates itself. There was a salmon-fishery below the cataract. Oak-trees grew on the summits of the surrounding rocks; and in the valleys some shells were seen remarkable for the acuteness of their spiral points. Here also grew a rare moss of a sulphur-green colour.

Passing through the town of Elf Carleby, our traveller crossed the river which divides it by a ferry; 'the ferryman never failing to ask every traveller for his passport or license to travel.' Proceeding towards Upland, the post-houses or inns were found to be 'dreadfully bad;' the forests became more and more hilly and stony; winter-green and the rose-willow abounded. A kind of stage was noticed for drying corn and pease on; it was formed of perpendicular posts with transverse beams, and was in common use throughout the northern provinces.

At Gefle, Linnæus visited the last apothecary's shop, and the last physician in the province, neither the one nor the other being to be met with in any place further north.

Linnæus frequently notices sepulchral mounds, Runic monumental stones, and other memorials of the northern nations.

On leaving Gefle 'the fir-trees all appeared tall and slender, and were laden with cones of three different stages of growth; some a year old, not larger than two peas, and of a globular figure; others two years' old, ovate and pointed; and the remainder ripe, with their scales open and reflexed, having been four years on the tree.' In the marshes the note of the snipe was heard continually. The sweet gall, laden with catkins about its upper branches, was abundant everywhere, as well as the dwarf birch. Here and there grew the marsh-violet with its pale grey flowers, marked with five or seven forked lines on the lower lip.

On arriving at Hamränge post-house and inquiring according to his custom about the natural curiosities of the place, Linnæus was told of an extraordinary kind of tree, growing near the road, which many persons had visited, but none could find out what it was. Some said it was an apple-tree which had been cursed by a beggar-woman, who one day having gathered an apple from it, and being on that account seized by the proprietor of the tree, declared that the tree should never bear fruit any more. Linnæus went to examine this wonderful tree, but it proved to be nothing more than a common elm, which however was somewhat rare in that part of the country.

'The spiders had now spread their curious mathematical webs over the pales and fences, and they were rendered conspicuous by the moisture with which the fog had besprinkled them. The red-wing, the cuckoo, the black grouse, and the mountain-finch, with their various notes made a concert in the forest, to which the lowing herds of cattle under the shade of the trees formed a bass.'

Not far from Norrala several pair of semicircular baskets made of wicker-work were placed in the water, intended principally to catch bream. Here was observed the black-throated diver, which uttered a melancholy note, especially in diving.

'From Norrala I proceeded to Enänger, through a heavy fog, as it had rained violently while I rested at the former place. Towards evening it thundered and lightened. In the course of this whole day's journey I observed a great variety in the face of the country as well as in the soil. Here are mountains, hills, marshes, lakes, forests, clay, sand, and pebbles; cultivated fields indeed are rare. The greater part of the country consists of uninhabitable mountainous tracts. In the valleys only are to be seen small dwelling-houses, to each of which adjoins a little field. Even in these there is no great proportion of fertile land, the principal part being marshy. The people seemed somewhat larger in stature than in other places, especially the men.' Linnæus accounted for this fact by the custom the mothers have of keeping children at the breast longer than is usual elsewhere, and then makes some remarks on the original stature of the human race, supposing, incorrectly enough, that from the time of the creation the race has gone on dwindling in size. As soon as he leaves off theorising, and proceeds with his narrative, Linnæus unconsciously assigns a reason for the robust stature of this sequestered people, viz. a deficiency of brandy, the free use of which, with an insufficient supply of nutritive food, has produced the diminutive stature remarkable in the Laplanders and some other northern people. 'Brandy is not always to be had here. The people are humane and civilized. Their houses are handsome externally, as well as neat and comfortable within, in which respects they have the advantage of most other places.' We should be disposed to refer this advantage also to a deficiency of brandy.

Linnæus notices the 'capital iron forge of Eksand, which has two hammers and one blast-furnace. The sons of Vulcan were working in their shirts, and seemed masters of their business.' Among the different kinds of ore worked here were noticed one containing beautiful cubical pyrites, and also a black ore which lies at the bottom of the sea, but in stormy weather is thrown upon the shore.

The boundary between Helsingland and Medelpad was marked by two posts, one on each side the road. Here the common ling began to be scarce, and the bilberry to be more abundant. Birch-trees were also numerous. On the left of the road were large mountains of granite, at the foot of which the whole country was covered with stones, about twice as large as a man's fist, of a greyish green colour, lying in heaps, and covered with a fine coating of moss, which seemed never to have been disturbed.

Our traveller noticed a brace of ptarmigans, but not being near enough to shoot them, he watched them through his spy-glass: they appeared mostly of a reddish cast, but the wing-feathers were snow-white. The large yellow aconite was very abundant. 'Not being eaten by any kind of cattle it grows luxuriantly, and increases abundantly in proportion as other herbs are devoured. Thus nature teaches the brute creation to distinguish without a preceptor what is useful from what is hurtful, while man is left to his own inquiries.'

At Nyæcker's-berg, a considerable mountain, the south side of which is very steep, the inhabitants had planted hop-grounds, the side of the mountain serving as a wall for the plants to run upon. They were thus sheltered from the cold north wind, and at the same time exposed to the heat of the sun.

Our traveller ascended the Norby Kuylen, the highest mountain in Medelpad. Tying his horse to an ancient Runic monumental stone, and accompanied by a guide, he climbed the mountain on the left side. Here he noticed a number of plants and a small rare moss After much fatigue they reached the summit of the mountain to the westward. Here the country people kept watch during the war with the Russians, as this place commands an extensive view for many miles round. They had collected a great quantity of wood, on which stood a pole with a tar-barrel placed transversely on its top. This was to be set on fire at the landing or approach of the enemy.

From the summit of this hill our naturalist had a view of the country, varied with plains and cultivated fields, villages, lakes, rivers, &c.; on the hill itself every kind of moss that could be found anywhere in the neighbouring country seemed to be collected. Trees of considerable size grew about the sides of the hill. At the very highest point the dung of the hare was seen; a certain proof of that animal's frequenting even these lofty regions.

'Leaving this mountain, and proceeding on my journey, the greater part of my way lay near the sea-shore, which was bespread with the wrecks of vessels. How many prayers, sighs and tears, vows and lamentations, all, alas, in vain! arose to my imagination at this melancholy spectacle! It brought to my mind the student[*] who in going by sea from Stockholm to Abo had experienced so severely the terrors of the deep, that he chose rather to walk back to Stockholm through East Bothnia, Tornea, West Bothnia, &c., than trust himself again to so cruel and treacherous a deity as Neptune.'

Not far distant from a mountain named Balingsbuget, and close to a church, a huge stone is to be seen. 'The credulous vulgar relate, that when the church was building, some malignant beings, of gigantic size, were desirous of knocking it down, but the stones thrown for that purpose fell short of the sacred spot. As a confirmation of this history, they shew the evident marks of four huge fingers and a thumb on the upper side of the stone.'

Between Norsby and Veda Linnæus climbed a hill which commanded a very extensive view of the surrounding country, 'which presented itself like clouds of dense vapour, rising one above another. The mountains looked quite blue from the fog which rose from them, and this vapour gave them the appearance of having each a more lofty summit than the hill before it. This was the case in every part of the prospect.'

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[*] 'This was Tillands, afterwards professor at Abo, who hence assumed this surname, expressive of his attachment to land, and Linnæus named in honour of him a plant which cannot bear wet.' —*Note by Translator.*

At Doggsta our indefatigable naturalist climbed a very steep and lofty mountain to inspect a cavern. The people told him it was impossible to reach it, and he had some difficulty in obtaining guides. 'We climbed the rocks, creeping on our hands and knees, and often slipping back again; we had no sooner advanced a little than all our labour was lost by a retrograde motion. Sometimes we caught hold of bushes, sometimes of small projecting stones. Had they failed us, which was very likely to have been the case, our lives might have paid for it. I was following one of the men in climbing a steep rock; but seeing the other had better success, I endeavoured to overtake him. I had but just left my former situation, when a large mass of rock broke down from a spot which my late guide had just passed, and fell exactly where I had been, with such force that it struck fire as it went. If I had not providentially changed my route, nobody would ever have heard of me more. Shortly afterwards another fragment came tumbling down. I am not sure that the man did not roll it down on purpose. At length, quite spent with toil, we reached the object of our pursuit, which is a cavity in the middle of the mountain. I expected to have seen something to repay my curiosity, but found a mere cavern, formed like a circle or arch, fourteen Parisian feet high, eighteen broad, and twenty-two long. The stones that compose it are of a very hard kind of quartz or spar, yet the sides of the cavern are in many places as even as if they had been cut artificially. Several different strata are distinguishable, particularly in the roof, which is concave, like an arch. In that part a hole appears, intended, as I was told, for a chimney. Whether it is pervious to any extent I know not. Some convulsions of the mountain seems to have shivered the rock in longitudinal fissures. All the shivers of stone, many of which lie on the floor, are quadrangular, and of a considerable size. I am fully persuaded of this grotto having been formed by the hand of nature, and that art had afterwards merely cleared away the fragments of stone. The entrance is sufficiently large to afford a full view of the inside, occupying an eighth part of the whole. Drops of water trickle down from the roof, near one of the sides. Ferns grow on the adjacent parts of the mountain. Before the orifice of this cavern grew a sallow-tree, which, when king Charles XI. passed this way, was cut down, and having grown up again, was a second time felled by the inhabitants.'

Proceeding northward to Angermanland, our traveller found the country covered with snow in patches some inches deep. The spring-flowers had gradually disappeared; the buds of the birch, which so greatly contribute to the beauty of the forests, were not yet put forth; nothing but wintry plants, the heath and the whortle-berry, peeped through the snow. Linnæus thought that the high mountains which surround this tract, and screen it from the genial western and southern breezes, added to the thick forests which will hardly allow the first mild showers of spring to reach the ground, might account for the long duration of the snow.

The people here make their bread in broad flat cakes. The flour used for this purpose commonly consists of one part barley and three of chaff. When they wish to have it *very good*, and the country is rich in barley, they add but two portions of chaff to one of corn. In summer they eat segmiolk (thick milk), prepared thus: —After the milk is turned and the curd taken out, the whey is put into a vessel, where it remains till it becomes sour. Immediately after the making of cheese fresh whey is poured lukewarm on the former sour whey. This is repeated several times, care being always taken that the fresh whey be lukewarm. Finally, they let the mixture remain for some time, the longer the better; and it becomes at length so glutinous, that it may be drawn out from one side of the house to the other. Even if a vessel be filled with it, and set by in the cellar, as is usually practised for winter provision, care must be taken that not the least drop may run out, otherwise the whole would escape, so great is the cohesion of its particles. This prepared milk is esteemed a great dainty by the country people. They consider it to be very cooling and refreshing. Sometimes it is eaten with fresh milk. In taking it from the dish it cannot be poured out, as it all runs back again if not cut with a knife,—or, as is more usual, parted by holding the finger against the edge of the spoon. A small quantity of this preparation is sometimes put into the barley-cakes to give them tenacity.

The coverlets of the beds in Angermanland were made of hare-skins.

As our traveller approached Westbothland, the height of the mountains, the quantity of large stones, and the extent of the forests, gradually decreased, and fir-trees became abundant. Intending to visit Lycksele Lapmark, he turned out of the main road. 'By this means,' he says, 'I missed the advantage I had hitherto had at the regular post-houses, of commanding a horse whenever I pleased, which is no small convenience to a stranger travelling in Sweden. It now became necessary for me to entreat, in the most submissive manner, when I stood in need of this useful animal. The road grew more and more narrow and bad, so that my horse went stumbling along, at almost every step, among stones, at the hazard of my life. My path was so narrow and intricate, along so many by-ways, that nothing human could have followed my track. In this dreary wilderness I began to feel very solitary, and to long earnestly for a companion. The mere exercise of a trotting horse, in a good road, to set the heart and spirits at liberty, would have been preferable to the slow and tedious mode of travelling which I was doomed to experience. The few inhabitants I met with had a foreign accent, and always concluded their sentences with an adjective.'

To complete the monotony of this day's journey, Linnæus found no natural objects to engage his attention. In the evening he arrived at Jamtboht, and found a number of women cutting the bark of the aspen-tree into small pieces as food for cows, goats, and sheep, hay being a very scarce article. The bark is stripped from the tree just when the leaves begin to sprout forth, and laid up in a place under the roof of a house till autumn or the following spring, when it is cut into the small fragments of about an inch long, and not quite half an inch broad. Our naturalist supped from the breast of a cock of the wood which had been shot and dressed some months before. Its aspect was not very inviting, but its taste proved delicious. It is prepared in the following manner: After the breast is plucked, separated from the other parts of the bird and cleaned, a gash is cut down the length of each side of the breast-bone quite through to the bottom, and two others parallel to it, a little further off, so that the inside of the flesh is laid open in order that it may be thoroughly dressed. The whole is first salted with fine salt for several days. Afterwards a small quantity of flour is strewed on the under side to prevent it sticking, and then it is put into an oven to be gradually dried. When done it is hung up in the roof of the house to be kept till wanted, where it may be kept as long as three years.

Violent rain coming on, our traveller passed the night at this place. The pillows of his bed were stuffed with the hair of the rein-deer, instead of feathers. Under the sheet was the hide of a rein-deer with the hair on, the hairy side uppermost.

At noon next day he proceeded on his journey over a road of stones piled on stones among large entangled roots of trees. Deep holes filled with water were numerous, and the frost which had but just left the ground made matters worse. 'All the elements were against me,' says Linnæus. 'The branches of the trees hung down before my eyes loaded with rain-drops, in every direction. Wherever any young birch-trees appeared, they were bent down to the earth, so that they could not be passed without the greatest difficulty. The aged pines, which for so many seasons had raised their proud tops above the rest of the forest, overthrown by the wrath of Juno, lay prostrate in my way. The rivulets which traversed the country in various directions were very deep, and the bridges over them so decayed and ruinous, that it was at the peril of one's neck to pass them on a stumbling horse.'

The people assured him that it was absolutely impossible to get to Lyckscle in the summer, or at any time, except when the frost had made a firm road; but comforting himself with the thought, that few things are impossible to courage and perseverance, our ardent naturalist proceeded, carefully noting on his way the plants, the animals, and the minerals, and the general aspect of the country.

In some of the houses he observed the agavia, shaped like a horse's hoof, hung up to serve as a pincushion. As a protection against rain, the people wear a broad horizontal collar made of birch-bark, fastened round the neck with pins. The bark of the birch is extremely useful to the Laplanders. Of it they make thin plates, or trenchers, boat-scoops, shoes, tubs to salt fish in, and baskets. The women wash their houses with a kind of brush, made of twigs of spruce-fir, which they tie to the right foot, and go backwards and forwards over the floor. The peasants instead of tobacco smoke the buds of hops, or sometimes juniper-berries, and when nothing else can be had, the bark of the juniper-tree; but to supply the want of snuff, they use ashes mixed with a small portion of real snuff. They strain their milk through platted tufts of hair from a cow's tail.

The roads continued to be execrable, so much so, that at one place the people were obliged to set out on Friday, in order to get to church on Sunday, the distance being only seven miles. The people must either undergo the hardship of this journey, or be fined ten silver dollars, and do penance for three Sundays. 'This,' says Sir J. E. Smith, 'is no new instance of contrariety between the tyranny of man and the gospel of Christ, whose "yoke is easy, and his burthen light."' 'How trifling,' says Linnæus, 'would be the expense of building a small church in this place, and how much have those in authority to answer for, before God, for neglecting to provide one.'

But Linnæus soon exchanged bad roads for smooth water: he found a boat proceeding along the western branch of the river of Umoca. 'When the sun rose nothing could be more pleasant than the view of this clear unruffled stream, neither contaminated by floods, nor disturbed by the breath of Æolus. All along its translucent margin the forests which clothed its banks were reflected like another landscape in the water. On both sides were several large level heaths, guarded by steep ramparts towards the river, and these were embellished with plants and bushes, the whole reversed in the water, appearing to great advantage. The huge pines which had hitherto braved Neptune's power, smiled with a fictitious shadow in the stream. Neptune however, in alliance with his brother Æolus, had already triumphed over many of their companions; the former by attacking their roots, while the latter had demolished their branches.'

Proceeding down the river our traveller quitted Westbothland, and entered the district of Lycksele, Lapland. The navigation was interrupted by small shelves forming cascades, and as these became abundant, the boatman laid his knapsack on his back, and turning the boat bottom upwards, placed the two oars so as to cross the seats. These rested on his arms as he carried the boat on his head, and thus he scampered away over hills and valleys.

On both sides of the river were seen several summer-tents of the Laplanders, in which they reside for a short time together during that season. A Laplander never remains more than a week on one spot, not only because of seeking fresh pasture for his reindeer, but because he cannot bear to stay long in one place. He drives the whole herd together, young and old, into the river to swim over to the opposite shore, which these animals easily perform, though the stream be very wide.

The riches of the Laplanders consist in the number of their reindeer, and in the extent of the ground in which they feed. The poorest people have from fifty to two hundred of these animals, the middle class from three hundred to seven hundred, and the rich possess about a thousand. The lands are from three to five miles in extent. Wild reindeer are seldom found in

Lapland. It very often happens that those whose herds are large lose some of their reindeer, which they generally find again in the ensuing season, and they then drive them back again to their old companions. If they will not follow the herd, they are immediately killed.

'Ovid's description of the silver age is still applicable to the native inhabitants of Lapland. Their soil is not wounded by the plough, nor is the iron din of arms to be heard; neither have mankind found their way to the bowels of the earth, nor do they engage in wars to define its boundaries. They perpetually change their abode, live in tents, and follow a pastoral life, just like the patriarchs of old.'

The month of June was now arrived, and our traveller pursued his journey by water with considerable labour and difficulty all night long, if it might be called night, which was as light as the day, the sun disappearing for about half an hour only, and the temperature of the air being rather cold. He continued his course up the river of Umoea, until he arrived at a branch named Juita, where he quitted the main stream. He continued to sail up the Juita until a very long shelvy contraction in the river obliged them to go by land in search of a guide. The path was very difficult to traverse; rivulets, stones, and fallen trees, were the larger obstructions, while their feet were entangled at every step by ling and empetrum, and the dwarf birch; while the bog-moss afforded a treacherous support. At length they came to a sort of bay or creek in the river, which was to be waded through. The water was very cold, and reached to their waists. In the midst of this creek was a very deep hole, across which they laid a pole, and so passed it at considerable hazard. 'We had next to pass a marshy tract, almost entirely under water for the course of a mile; nor is it easy to conceive the difficulties of the undertaking. At every step we were knee-deep in water; and if we thought to find a sure footing on some grassy tuft, it proved treacherous, and only sunk us lower. Sometimes we came where no bottom was to be felt, and were obliged to measure back our weary steps. Our half-boots were filled with the coldest water, as the frost in some places still remained on the ground. Had our sufferings been inflicted as a capital punishment, they would, even in that case, have been cruel: what then had we to complain of? I wished I had never undertaken my journey, for all the elements seemed adverse. It rained and blowed hard upon us. I wondered that I escaped with life, though certainly not without excessive fatigue and loss of strength.

'After having thus for a long time gone in pursuit of my new Lapland guide, we reposed ourselves about six o'clock in the morning, wrung the water out of our clothes, and dried our weary limbs, while the cold north wind parched us as much on one side as the fire scorched us on the other, and the gnats kept inflicting their stings. I had now my fill of travelling.'

They found a man living near this forlorn spot, who went in search of a guide while Linnæus rested a little near the fire. He says, 'I wished for nothing so much as to be able to go back by water to the place from whence I came; but I dreaded returning to the boat the way we had already passed, knowing my corporeal frame to be not altogether of iron or steel. I would gladly have gone eight or ten miles by a dry road to the boat, but no such road was here to be found. The hardy Laplanders themselves, born to labour as the birds to fly, could not help complaining, and declared they had never been reduced to such extremity before. I could not help pitying them.'

After waiting some hours the Laplander returned, accompanied by a woman of very diminutive stature; her face of the darkest brown from the effects of smoke; her eyes dark and sparkling; her eyebrows black; her pitchy coloured hair hanging loose about her head, on which she wore a flat red cap. She had a grey petticoat; her neck and bust, which resembled the skin of a frog, were adorned with brass rings; round her waist she wore a girdle; and on her feet a pair of half-boots.

Her first aspect frightened our traveller; but though a fury in appearance, she spoke with mingled pity and reserve. 'O thou poor man! what hard destiny can have brought thee hither, to a place never visited by any one before? This is the first time I ever beheld a stranger. Thou miserable creature! how didst thou come, and whither wilt thou go? Dost thou not perceive what houses and habitations we have, and with how much difficulty we go to church?'

Linnæus intreated her to point out some way by which he might continue his journey in any direction so as not to be forced to return the same way that he came.

'Nay, man,' said she, 'thou hast only to go the same way back again; for the river overflows so much, it is not possible for thee to proceed further in this direction. From us thou hast no assistance to expect in the prosecution of thy journey, as my husband, who might have helped thee, is ill. Thou mayest inquire for our next neighbour, who lives about a mile off, and perhaps, if thou shouldest meet with him, he may give thee some assistance; but I really believe it will scarcely be in his power.'

'My health and strength being by this time materially impaired by wading through such an extent of marshes, laden with my apparel and luggage, for the Laplander had enough to do to carry the boat; by walking for whole nights together; by not having for a long time tasted any boiled meat; by drinking a great quantity of water, as nothing else was to be had; and by eating nothing but fish, unsalted, and crawling with vermin, I must have perished but for a piece of dried and salted reindeer's flesh, given me by my kind hostess the clergyman's wife at Lycksele. This food however, without bread, proved unwholesome and indigestible. How I longed once more to meet with people who feed on spoon-meat! I inquired of this woman whether she could give me anything to eat. She replied, "Nothing but fish." I looked at the fresh fish, as it was called; but perceiving its mouth to be full of maggots, I had no appetite to touch it; but though it thus abated my hunger, it did not recruit my strength. I asked if I could have any reindeer tongues, which are commonly dried for sale, and served up even at the tables of the great: but was answered in the negative. "Have you no cheese made of reindeer's milk?" said I. "Yes," replied she, "but it is a mile off." "If it were here, would you allow me to buy some?" "I have no desire," answered the good woman, "that thou shouldest die in my country for want of food." On my arriving at her hut I perceived three cheeses lying under a shed without walls, and took the smallest of them, which she, after some consultation, allowed me to purchase.'

At length our traveller was forced to return by the course of the river; having, as he remarks, with the thoughtlessness of youth, undertaken more than it was possible to perform. The note of some ptarmigans sounded like a kind of laughter in his ears. He was almost starved, having had nothing fit to eat or drink for four days. His stomach could not digest the dried flesh of the reindeer, and the fish was putrid. At length he happily reached the house of the curate, and obtained some fresh meat.

Linnæus noticed that the chief remedy of the Laplanders against the gnats was smoking themselves as well as their reindeer with the agaric of the spruce-fir. When the gnats become very numerous and troublesome, they force the reindeer from their pastures.

'The reindeer suffers great hardship in autumn, when, the snow being all melted away during summer, a sudden frost freezes the mountain-lichen, which is his only winter food. When this fails the animal has no resource, for he never touches hay. His keepers fell the trees in order to supply him with the filamentous lichens that clothe their branches; but this kind of food does not supply the place of what is natural to him. It is astonishing how he can get at his proper food through the deep snow that covers it, and by which it is protected from the severe frosts. The reindeer feeds also on frogs, snakes, and even on the lemming or mountain-rat, often pursuing the latter to so great a distance as not to find his way back again.'

Linnæus enters at some length into the domestic economy, manners and customs of the Laplanders. It is beyond the purpose of this notice to do more than follow the traveller through these wild and barren regions, and transfer a few of his interesting remarks to our pages, connecting them with a brief epitome of his proceedings, sufficient to give to these extracts the interest of a continuous narrative.

'The bountiful provision of nature is evinced in providing mankind with bed and bedding even in this savage wilderness. The great hair-moss grows copiously in their damp forests, and is used for this purpose. They choose the starry-headed plants, out of the tufts of which they cut a surface as large as they please for a bed or bolster, separating it from the earth beneath; and although the shoots are scarcely branched, they are nevertheless so entangled at the roots as not to be separable from each other. This mossy cushion is very soft and elastic, not growing hard by pressure; and if a similar portion of it be made to serve as a coverlet, nothing can be more warm and comfortable.' 'The Laplanders fold this bed together, tying it up into a roll, that may be grasped by a man's arms, which, if necessary, they carry with them to the place where they mean to sleep the night following. If it becomes too dry and compressed, its former elasticity is restored by a little moisture.'

Linnæus was now retracing his steps, and again visited the town of Umoea, after an absence of twelve days. A remarkable change had taken place in the appearance of the country. Large flies, like gnats, with great black wings, were flying about in the air; lady-birds were also to be seen; the aspen-trees, which a fortnight before had been quite leafless, were now in full foliage; the grass, also, was very dry.

On the 12th of June, very early in the morning, Linnæus departed from Umoea. 'The weather was so hazy I could not see the distance of half a gun-shot before me. I wandered along in a perpetual mist, which made the grass as wet as if it had rained. The sun appeared quite dim, wading, as it were, through the clouds. By nine o'clock the mists began to disperse, and the sun shone forth. The spruce-fir, hitherto of an uniform dark green, now began to put forth its lighter-coloured buds, a welcome sign of advancing summer.' 'The andromeda polifolia was at this time in its highest beauty, decorating the marshy grounds in a most agreeable manner. The flowers are quite blood-red, but when full grown the corolla is of a flesh-colour. Scarcely any painter's art can so happily imitate the beauty of a fine female complexion; still less could any artificial colour, upon the face itself, bear a comparison with this lovely blossom.' Everywhere near the road grew the herbaceous comelo; all the little woods and copses by the road-side abounded with butterflies of the fritillary tribe, without silver spots. The great dragon-fly, with two flat lobes at its tail, and another species, with blue wings, were also common.

Linnæus now entered the territory of Pithoea. At the post-houses of Gremersmark and Sela he was told of a neighbouring mountain, reputed to contain copper. Three years before a man had been sent by the Board for Mining Affairs to examine the mountain; but the peasants of the neighbourhood, in consequence of the threats of the burghers of Umoea, were deterred from giving him proper directions, and put him on a wrong scent. They kept this stranger from the knowledge of Hans Person, a peasant at Webomark, who would have conducted him right. The father of this Hans was the first discoverer of the mountain in question, and undertook a journey to Stockholm with a small barrel of the ore; but before he set off his neighbours made him drunk, and took out the proper ore, replacing it in his barrel with lumps of granite.

Arriving at the post-house of Junnanaen, Linnæus was gratified with a view of a fine river, and the very neat little town of Skelleftea, consisting of two principal streets, and several cross ones, with a church. The houses were about three hundred and fifty or four hundred in number, and their white chimneys gave them a cheerful aspect. It was stated that every peasant in the parish had a house of his own in the town for the use of his family during festivals.

Linnæus noticed in the river a curious salmon-trap. It was made of long slender laths, bound together with flexible twigs of osier into a cylindrical form, open at the base, and furnished with twigs in that part placed like the wires of a mousetrap, but in a double row, that they might be so much the stronger. The open space between them was enough to admit a man's head; on one side further on was a door to take out the fish when caught.

The dean of Skelleftra related an anecdote of a Laplander, who at the last court of justice held there summoned his neighbour for having twice as much land without paying any greater share of taxes than himself. The man summoned was of course sentenced to pay double what he paid before. This provoked him so much that he immediately gave information of a vein of silver on his own estate, in consequence of which he was, by the fundamental laws of the realm, exempt from all taxes whatsoever. He then went to his adversary in triumph, exclaiming, 'See how matters go now; I am exempt from taxes, but how is it with you?'

The path of our traveller was near the sea, which in many places came very near the road, lashing the stony crags with its formidable waves. In the evening, a little before sunset, he was assailed by such a multitude of gnats, that they seemed to occupy the whole atmosphere. 'They filled my mouth, nose, and eyes, for they took no pains to get out of my way. Luckily they did not attack me with their bites or stings, though they almost choked me.' At sunset he reached the town of Old Pithoca, procured a lodging, and went to bed, but he soon perceived a glare of light on the wall of the chamber. 'I was alarmed with the idea of fire; but on looking out of the window, saw the sun rising perfectly red, which I did not expect could take place so soon. The cock crowed, the birds began to sing, and sleep was banished from my eye-lids.'

On the 21st of June, Linnæus, after having rested a few days at Old Pithoea, during which time he explored the immediate neighbourhood of that place, proceeded on his travels, and entered the district of Lulea.

'In passing over a meadow towards the water-side, I heard something snap and crackle in the marshes, as if the water had been boiling. In several places the latter was dried up, so that mud only remained, and these spots were almost entirely covered with a kind of shell-fish, which made the above-mentioned noise. I observed the same in several similar places, but in others none were to be seen till I had stirred up the mud, when it proved full of these animals, which seemed to have made their way deeper and deeper into the soil as the water had withdrawn. The same sound may be observed in a thousand places, originally dry, when the water has access to them, but I had never ascertained the cause till now.'

The weather had now for several days been bright, warm, and for the most part calm. 'The meadows were still fine and beautiful in their aspect, and every thing conspired to favour the health and pleasure of the beholder. If the summer be indeed shorter here than in any other part of the world, it must be allowed at the same time to be nowhere more delightful.'

'Midsummer day. Blessed be the Lord for the beauty of summer and of spring, and for what is here in greater perfection than almost anywhere else in the world—the air, the water, the verdure of the herbage, and the song of birds!'

At Jockmock, in Lulean Lapland, Linnæus was tormented with the 'consummate and most pertinacious ignorance' of the curate and schoolmaster. The curate gravely asserted that the clouds in Lapland struck the mountains, and carried off stones, trees, and cattle in their passage. 'I ventured to suggest that such accidents were rather to be attributed to the force of the wind, for that the clouds could not of themselves lift or carry away anything. He laughed at me, saying, surely I had never seen any clouds. For my part it seemed to me that he could have never been anywhere but in the clouds. I replied that whenever the weather is foggy, I walk in clouds, and when the fog is condensed, and no longer supported in the air, it immediately rains beneath my feet. At all such reasoning, being above his comprehension, he only laughed satirically; still less was he satisfied with my explanation how watery bubbles may be lifted up into the air, as he told me the clouds were solid bodies. On my denying this, he reinforced his assertion with a text of scripture, silencing me by authority, and then laughing at my ignorance. He next condescended to inform me that after rain a phlegm is always to be found on the mountains where the clouds have touched them. Upon my replying that this phlegm is a vegetable called *Nostoc*, I was, like St. Paul, judged to be mad, and that too much learning had turned my brain. This philosopher, who was as fully persuaded of his own complete knowledge of nature, as Sturmius was of being able to fly by means of hollow globes, was pleased to be very facetious at my expense. At length he graciously advised me to pay some regard to the opinions of people skilled in these abstruse matters, and not, at my return home, to expose myself by publishing such absurd and preposterous opinions as I had now advanced.

'The other, the pedagogue, lamented that people should bestow so much attention upon temporal vanities, and consequently, alas! neglect their spiritual good; and he remarked that many a man had been ruined by too great application to study.

'Both these wise men concurred in one thing. They could not conceal their wonder that the Royal Academy should expressly have appointed a mere student for the purposes for which I was sent, without considering that there were already as competent men resident in the country, who would have undertaken the business. They declared they would either of them have been ready to accept of the charge. In my opinion, however, they would have but exhibited a fresh illustration of the proverb of the ass and the lyre.'

On the last day of June Linnæus arrived at the lake of Randian, with nothing before him but 'lofty mountains of an oblong obtuse form, lifting their summits one above another, and on the most distant of these snow was to be seen, though half melted away like snow in the spring.' These mountains, however, were but the rear-guard of others of a grander character, whose summits reached the clouds, and indeed resembled a range of white clouds rising from the horizon. Advancing towards them, 'mountains upon mountains rose before me in every direction. In a word, I now beheld the Lapland alps.'

Journeying on at a leisurely pace, collecting plants, and noting down the manners and customs of the people, their useful arts and modes of life, Linnæus arrived on the sixth of July at the mountain of Wallavari, on ascending which, he seemed to be in a new world: the soil, situation, and every one of the plants, being equally strange. 'Indeed, I was now for the first time upon the alps! Snowy mountains encompassed me on every side. I walked in snow as if it had been the severest winter. All the rare plants that I had previously met with, and which had from time to time afforded me so much pleasure, were here as in miniature, and now also in such profusion, that I was overcome with astonishment, thinking I had now found more than I should know what to do with.' Among many other plants, Linnæus noted the silken-leaved alpine lady's mantle, the deep green sibbaldia, the little purple-flowered azalea, the beautiful saxafraga stellaris, rivularis, and oppositifolia, the succulent rose-root, the red lychnis, and several ranunculi.

'The lofty mountains, piled one upon another, shewed no signs of volcanic fire, but were covered with stones all of a fissile kind, and by that means easily distinguishable. From the snow which lay so plentifully on these mountains as to cover half the ground, water was continually running down in streams like so many springs, or like rivers cut through the deep snow, for the refreshment of travellers. We found it very good.

'The little Alpine variety of the ptarmigan was now accompanied by its young. I caught one of them, upon which the hen ran so close to me, that I could easily have taken her also. She kept continually jumping round and round me; but I thought it a pity to deprive the tender brood of their mother, neither would my compassion for the mother allow me long to detain her offspring, which I restored to her in safety.'

After walking four or five miles in the course of the night, our traveller arrived at a cottage, where he obtained lodging. Next morning the family, sixteen in number, rose at the same time, and washed themselves, 'by rubbing the body downwards, not upwards.' After washing their dishes with their fingers, with the assistance of water spirted out of the mouth, they prepared a breakfast of reindeer's milk. Some thousands of rein-deer came home in the course of the morning to be milked. All the people wore garments made of reindeer-skins. Both men and women were fond of smoking, and were willing to give double its value in cheese for a roll of tobacco.

On the eighth of July, after a very busy day's work in collecting and cataloguing plants, night overtook our traveller and his guide, and both were uncertain as to the direction of the Laplander's hut. 'Tracts made by the reindeer were plentiful enough in the marshy grounds, which we followed sometimes in one direction, sometimes in another, without their leading us to what we were in search of. I had walked so much that I could hardly stand on my legs, and was near fainting with fatigue, so that I lay down, resolving rather to endure the cold and boisterous wind, than proceed any further this night. At length the Laplander and his servant, who were my guides, found some dung of the reindeer. One of them took it up, and after squeezing it in his hand and smelling at it, gave it to his companion to smell also. He was even desirous that I should take a snuff at it. By its freshness they were rejoiced to discover that a Laplander with his herd had but recently left this spot, and they accordingly pursued a track, which was here and there discernible in the snow. After we had proceeded half a mile, we met with the object of our search, who had removed but the day before, so that I had now an opportunity of taking some repose.'

The next day Linnæus rested in order to recover from his fatigue, and employed his time in making some interesting observations on the reindeer, from which we abridge the following:—

The reindeer are innumerable, like the trees of the forests they inhabit. The herds are driven home night and morning to be milked. It was amusing to observe the manner of driving them performed by a maidservant with a dog. If the reindeer proved refractory, the dog easily made them obey the word of command, particularly when seconded by the hissing of the woman, at which they were extremely terrified.

In driving them out to pasture, the woman took a circuitous path, in order not to face the wind, for if allowed to do so, the reindeer run very fast, and without intermission, expecting to find a cool place. They seem to be greatly distressed by heat and by the gnats, and will eat nothing at such a time. They are also in great terror at a species of gad-fly. Linnæus has seen a herd of five hundred in great agitation, changing their posture, starting, puffing, and blowing continually, every one trembling and pushing its neighbour, when perhaps not more than ten flies were present. The fly meanwhile was trying every means to get at them, but it no sooner touched any part of their bodies, than they made an immediate effort to shake it off. The insect flies about with its tail protruded, and as the reindeer's coat is very thin at this season, most of the hair having fallen off, it is much exposed to attack. Linnæus has no doubt that the spots and imperfections in the skins of reindeer originate in the perforations made by insects, through which they introduce their eggs. When the maggots come out of the reindeer's skin, they leave a wound, which is closed by a scar.

'As the reindeer walks along a crackling noise proceeds from its feet. This excited my curiosity; and inquiring what was supposed to be the cause, the only answer I could get from any one was, that "our Lord had made it so." I inquired further in what manner our Lord had formed the reindeer, so as to produce such an effect; but to this the respondent answered nothing. When I laid hold of the animal's foot, pulled it, twisted and stretched it, or pushed it backward and forward in every possible way, no crackling was produced. At length I discovered the cause in the hoofs themselves, which are hollowed at their inner side. When the animal stands on its feet, the hoofs are of course widely expanded, and their points most remote from each other; but every time the foot is lifted from the ground, they strike together, and cause the noise abovementioned. This I was afterwards able to imitate at pleasure by moving the foot with my hand.'

When the reindeer are driven to the accustomed milking-place they all lie down, breathing hard and panting violently, chewing the cud all the while. Each of the people then takes a small rope, and making a noose throws it over the head of one of the females intended to be milked. The cord is afterwards twisted round the horns, and the other end tied to a small pole fixed in the ground. One pole is sufficient to secure four of the animals. If the milk does not come readily the milkers beat the udder very hard with their hands, which causes a greater flow. The dugs are four, very rarely six, all yielding milk. When the milking is over the dugs are smeared with dung, to prevent the fawns sucking too much. It dries upon the nipple, and is easily rubbed off after some hours.

When the fawn is missed by its mother, she runs in search of it with the greatest anxiety, snorting with her nose to the ground till she finds it. She even quits the herd, and seeks her young at the Laplander's hut.

Every individual of a herd, however numerous, has its appropriate name, which the owner knows perfectly. 'This seemed to me truly astonishing, as the form and colour are so much alike in all, and the latter varies in each individual every month. The size also varies according to the age of the animal. To be able to distinguish one from another among such multitudes, for they are like ants on an anthill, was beyond my comprehension.'

The reindeer not only supplies the Laplanders with milk (from which no less than nineteen different dishes are prepared) and flesh, but its skin supplies clothes, beds, bags, purses, and a variety of domestic articles too numerous to mention. The tendons in the legs of the animal serve to make thread or cord. The Laplanders lay hold of these with their mouths, split and moisten them, rubbing them from time to time with reindeer marrow, preserved in bladders for that use, in order to render them as supple as possible. Each string is made sharp at both ends, and drawn through holes of various sizes in an instrument made on purpose of wood or metal, to render it fine and smooth. Two such threads are then twisted together by means of the hand upon the thigh or knee. They are generally held with the left hand, and twisted with the right upon the left knee, proceeding downwards, the thread being moistened from time to time with saliva.

On several occasions Linnæus notices the happy and contented condition of the people:—'I witnessed with pleasure,' says he, 'the supreme tranquillity enjoyed by the inhabitants of this sequestered country. After they have milked their reindeer, and the women have made their cheese, boiled their whey to the requisite consistence, and taken their simple repast, they lie down to enjoy that sound sleep which is the reward and the proof of their innocent lives. There is rarely any contention among them.'

On the 11th of July Linnæus proceeded on his journey. After walking with some difficulty over an icy mountain, he observed the streams beginning to flow westward, a proof that he had entered upon Norwegian Lapland. Vegetation had entirely disappeared; the cold east wind quickened his steps, and at length became so violent, that at one point he was nearly blown over the edge of a precipice. The rain, which fell in torrents, froze in the shoes and backs into a crust of ice. About noon he arrived at the bold and precipitous limits of these alps to the westward. 'The ample forests, spread out beneath us, looked like fine green fields, the loftiest trees appearing no more than herbs of the humblest growth.' On descending the mountain the alpine plants gradually disappeared; and on arriving at the plains below, 'how grateful was the transition from a chill and frozen mountain to a warm balmy valley! I sat down to regale myself with strawberries. Instead of ice and snow I was surrounded with vegetation in all its prime. Such tall grass I had never before beheld in any country. Instead of the blustering wind so lately experienced, soft gales wafted around us the grateful scent of flowery clover and various other plants.'

Linnæus was struck with the circumstance, that the two natives who accompanied him and carried his packages, shewed no symptoms of fatigue. He attributes their superiority in walking and running to several causes; namely, to their wearing no heels on their boots; to their being accustomed to running from their infancy; to their exemption from hard labour; to the constant use of their muscles; to the almost exclusive use of animal food; to the moderation with which they eat, and to the smallness of their stature. Their excellent health he attributes to the pure air which they breathe; to the excellence of the water, which they drink to the almost total exclusion of spirituous liquors; to their eating their meat cold, or but slightly warmed; to their tranquillity of mind; and their being inured to a rigorous climate from their infancy.

Our traveller was now close to the sea-coast, and having made an agreement with a ship-master, set sail next morning; but the wind being contrary, Linnæus amused himself in examining various petrifactions, zoophytes, and submarine plants, which occupied every part of the coast. In the evening he arrived at Torfjorden, and met with a kind reception from Mr. Rask, the pastor.

A day or two after this Linnæus had climbed one of the neighbouring mountains, with the intention of measuring its height. While he was reposing on the side of the hill, busied only in loosening a stone, which he wanted to examine, he heard the report of a gun at a small distance below. The bullet struck a stone close to the spot where Linnæus was, and, on looking down, he saw the man who fired the shot; and on pursuing him he immediately made off. Linnæus could get no information as to who this man was, or what prompted his murderous intention.

On the 15th July he set out on his return, and during the whole day was occupied in climbing the mountains. The heat was for some time very oppressive, but 'when we reached the cold snowy mountains, indeed, we had sufficient opportunity to cool ourselves.'

From hence they directed their course towards the alps of Tornea, which were said to be forty miles distant. 'What I endured in the course of this journey is hardly to be described. How many weary steps was I obliged to set to climb the precipices that came in my way, and how excessive were my perspiration and fatigue! Nor were these the worst evils we had to encounter before we reached Caituma. Sometimes we were enveloped with clouds, so that we could not see before us: sometimes rivers impeded our progress, and obliged us either to choose a very circuitous path, or to wade naked through the cold snow-water. This fresh snow-water however proved a most welcome and salutary refreshment, for without it we should never have been able to encounter the excessive heat of the weather. Water was our only drink during this journey, but it never proved so refreshing as when we sucked it out of the melting snow. Having nearly reached the Lapland village of Caituma, the inhabitants of which seemed perfectly wild, running away from their huts as soon as they perceived us approaching from a considerable distance, I began to be tired of advancing further up into this inhospitable country.' Their stock of bread was exhausted, and the rich milk of the reindeer was too luscious to be eaten without it; and the ordinary cheese of the country produced painful indigestions. Linnæus, under all these circumstances, determined to return towards Quickjock, a journey of about forty miles. In the course of his journey he met with an accident which fortunately produced no serious result. Walking over the snow he broke through the icy crust which covered a deep hole. This cavity was very steep, and so hollowed out by the water, that it surrounded our traveller like a wall. The guides could not release him until they had procured a rope, when he was drawn out with no other injury than a hurt on the thigh, which continued to be felt for a month afterwards.

They arrived at Quickjock after having been four weeks without tasting bread. 'Those who have not experienced the want of this essential support of life can scarcely imagine how hard it is to be deprived of it so long, even with a superfluity of all other kinds of food.' After remaining four days at this place they descended the river to Lulea. There was no boat to be had, and they were therefore obliged to construct a raft. The voyage was very perilous, for the wind and the current on one occasion overturned the raft, and endangered their lives, the time being night, and no one within hearing of their cries for assistance.

At Parkijaur Linnæus hired a man to show him the manner of fishing for pearls. The man formed a raft of five timbers, at each end of which a large stone was fastened by a cord to serve the purpose of an anchor. He guided the raft by means of a pole. The bottom of the river was not easily distinguishable at any great depth; but when he could see it distinctly he dropped his stone anchor, and remained stationary. When the water was shallow he stood upright on his raft; but where the depth was considerable he lay at full length with his face downwards, looking over the edge of the raft. By means of a pair of wooden pincers, two fathoms in length, he laid hold of the pearl-oysters, or rather muscles, and drew them up. The shells were generally open, so that they might readily be discerned by the thickness of their inside; but when the water is very much agitated the animals immediately close their shells. The man opened the shells by means of a whilk-shell, and then sought for the pearls on the inside of the valve: the colour of the pearls is the same as that of the interior of the valve, whether it be white, dark, or reddish. There is no external sign about the shell to indicate a pearl within; consequently many thousands are destroyed to no purpose before one pearl is found. The pearl when found is either attached to the shell or loose, and it is sometimes thrown out of the shell spontaneously by its inhabitant.

Linnæus gives an interesting picture of a forest on fire. The drought of the season had made the trees very inflammable, and the lightning's stroke began the conflagration. In many places the devastation extended over a space of several miles. 'I traversed a place three quarters of a mile in extent which was entirely burnt, so that Flora, instead of appearing in her gay and verdant attire, was in deep sable; a spectacle more abhorrent to my feelings than to see her clad in the white livery of winter, for this, though it destroys the herbage, leaves the roots in safety, which the fire does not. The fire was nearly extinguished in most of the spots we visited, except in anthills and dry trunks of trees. After we had travelled about half a quarter of a mile across one of these scenes of desolation, the wind began to blow with rather more force than it had done, upon which a sudden noise arose in the half-burnt forest, such as I can only compare to what may be imagined among a large army attacked by an enemy. We knew not whither to turn our steps. The smoke would not suffer us to remain where we were, nor durst we turn back. It seemed best to hasten forward, in hopes of speedily reaching the outskirts of the wood; but in this we were disappointed. We ran as fast as we could, in order to avoid being crushed by the falling trees, some of which threatened us every minute. Sometimes the fall of a huge trunk was so sudden, that we stood aghast, not knowing whither to turn to escape destruction, and throwing ourselves entirely on the protection of providence. In one instance a large tree fell exactly between me and my guide, who walked not more than a fathom from me, but, thanks to God! we both escaped in safety. We were not a little rejoiced when this perilous adventure terminated, for we had felt all the while like a couple of outlaws, in momentary fear of surprise.'

On the 30th of July Linnæus arrived at Lulea, and then proceeded to Tornea, which he reached on the 5th of August. The next day being the 'holy sabbath, was therefore a day of recreation for both mind and body.' In the church of Tornea was a memorial of King Charles the Eleventh's own observation of the sun in the night between the 13th and 14th of June, 1694. His majesty, accompanied by some of his ministers and learned men, ascended the belfry of the church to view the midnight sun, at that time visible from that elevation. The sun continued to be visible till nearly twelve o'clock, when a small cloud hid it from the sight. It was, however, above the horizon.

From Tornea Linnæus proceeded to Kimi, and afterwards entered East Bothland; but not being acquainted with the Finnish language, he found it inconvenient to proceed. He therefore returned to Tornea, and proceeded in a boat to within four miles of Tucke-, sceni, but the frost beginning to set in severely, and nothing very remarkable to be seen, he was compelled once more to return. Having noted down the Finnish names for such articles as he might require, he again ventured into East Bothnia, considering that 'in a new country there is always something new to be seen, and that to travel the same road I had come, would probably afford but little entertainment or instruction.'

He therefore pursued his way along the coast through East Bothland, and Finland, visiting Ulea, Brackestad, Old and New Carleby, Wasa, Christina, Biorreborg, and Abo. He then went by the post-yacht to Aland, crossed the sea of Aland, and reached Upsal on the 10th of October.

The whole extent of this journey amounted to three thousand seven hundred and ninety-eight English miles.

The unaffected piety of Linnæus appears from several entries in his private journal, recording his gratitude to the Almighty, and his deep sense of the constant presence of an over-ruling providence. Thus, on arriving at Upsal his gratitude and joy prompted the following entry:—

'To the Maker and Preserver of all things be praise, honour, and glory, for ever!'

## CORRESPONDENCE OF LINNÆUS.

As Linnæus was fixed for the greater part of his life in the remote University of Upsal, most of the communications which he received on the objects of his studies were by the letters of his friends, amongst whom are to be found almost every man of scientific rank in Europe, and every traveller during the period of half a century. Linnæus seems to have preserved all the letters which he received; but it affords matter for regret, that he kept copies of but few of those which he wrote. His correspondence was so extensive, that he declared to a friend, that ten persons as industrious as himself would be insufficient to return proper answers to all the letters which he received. At one time, he drew up a list containing the names of one hundred and fifty persons with whom he was in the habit of corresponding.

Most of the letters of Linnæus's correspondents came into the possession of Sir J. E. Smith, as has been already noticed, from which a 'Selection,' in two volumes, has been published. We propose to fill up our brief remaining space with a few extracts from this selection.

Bernard de Jussieu wrote many letters to Linnæus. On the 20th July, 1740, he writes from Paris to his 'dear and much esteemed friend' Linnæus at Stockholm. He says, 'I have received two letters from you since your prosperous return to your native country, by which I am informed of your happy marriage. Nothing gives me more pleasure than to congratulate you on your fortunate lot, after so many labours and exertions, in being quietly settled under your own roof, enjoying well-earned fame in medicine, and especially that eminent botanical appointment to which you are so fully entitled. At all these events I most sincerely rejoice; not that I ever doubted of your success, but the news of it is most welcome to me.' * * 'Your distinguished Mæcenas, Mr. Cliffort, has been so good as to send me in due time the *Hortus Cliffortianus.* I have returned my best thanks for so great a favour. I can only wish that it were in my power to render you more service. I am ashamed to have allowed so much time to pass without writing. I must beg your indulgence in favour of one who holds you in the highest esteem, and who can never cease to love and value you.'

Linnæus corresponded extensively with the celebrated naturalist and physician Haller, who has published the correspondence; and thus preserved many of the letters of Linnæus, which might otherwise have been lost. The first letter of the young Swede was written under the supposition that Haller was opposed to his system, and affords an excellent specimen of the spirit of kindness and desire of unity which actuated him in his dealings with a supposed adversary. The letter is so long that we can only give a few passages.

'I must declare that I am anxious to avoid, if possible, all anger or controversy with you; my wish is rather to act in conjunction with you. I should detest being your adversary, and as far as possible I will avoid it. May there be peace in our days! I have always, from the time I first heard your name, held you in the highest estimation, nor am I conscious of ever having shown a contrary disposition. Why then should you provoke me to a dispute? Let me know if I have unwillingly offended, and I will omit nothing to satisfy you. I ask but for peace.

'If my harmless sexual system be the only cause of offence, I cannot but protest against so much injustice. I have never spoken of that as a natural method; on the contrary, in my *Systema* I have said, "No natural botanical system has been yet constructed, though one or two may be more so than others; nor do I contend that this system is by any means natural. Probably I may, on a future occasion, propose some fragments of such an one, &c. Meanwhile, till that is discovered, artificial systems are indispensable."

'If you detect any mistakes of mine, I rely on your superior knowledge to excuse them; for who has ever avoided errors in the wide extended field of nature? Who is furnished with a sufficient stock of observations? I shall be thankful for your friendly corrections. I have done what I could of myself; but a lofty tree does not attain its full stature by the first storm that bursts forth.

'I have been acquainted with most botanists of distinction, who have all given me their encouragement; nor has any one of them ever thwarted my insatiable desire of natural knowledge. Will you be more severe than any body else? You appear, by your dissertation, too noble to triumph over the ignorance of others.

'I dread all controversies, as, whether conqueror or conquered, I can never escape disgrace. Who ever fought without some wound, or some injurious consequence? Time is too precious, and can be far better employed by me, as well as by you. I am too young to take up arms, which, if once taken, cannot be laid aside till the war is concluded, which may last our lives. And, after all, the serious contentions of our time may, fifty years hence, seem to our successors no better than a puppet-show. I should be less ashamed to receive admonition from you than you must be to take it from me.

'Behold, then, your enemy, submissively seeking your friendship; which, if you grant, you will be more certain of securing a friend than of stirring up an adversary. I know you to be of a more generous nature than to level your attacks at me who has not offended, unless any enemies of mine have raised doubts in your mind against me. If, after all, I cannot obtain that peace which, by every argument and supplication I seek of you, I hope you will at least be so generous as to send me whatever you may print on the subject, and I will take care to convey my answers to you.'

This letter led to a friendship between the two great naturalists, and a correspondence, which lasted during their lives.

In one of his letters to Haller, Linnæus says:

'Jussieu is my friend, and so is Dillenius. I had never any acquaintance with Vaillant. He was a man full of himself, ambitious of raising his own fame on the overthrow of his teacher, the honourable and excellent Tournefort. Vaillant was merely demonstrator in the Paris garden, and rude in literature. He set himself up against Jussieu, and once laughed Dillenius to scorn. * * * All this is nothing to me. I wish to be a just and reasonable man, as well as a botanist. I confess I never yet read any writer who was more accurate than Vaillant, who made more discoveries in botany, who laboured harder, or reaped a more sparing reward. Is a man to be handed down to posterity either as a scoundrel, a madman, or the most stupid of all mortals, merely because he has pursued, honoured, and laboured to improve botany? Jussieu, as I am informed, has solemnly sworn hostility to the memory of Vaillant during his own life; nor is Dillenius content with the numerous cavils with which he has insulted his manes in the *Hortus Elthamensis.* Admit that Vaillant has his faults in synonymy, or perhaps other respects. Who has ever been free from botanical errors? He is a wise man who can distinguish good from evil; and that general may be esteemed happy who conquers and disperses his enemies with the loss of half his own forces. * * * But an honest man ought to do justice to every one's deserts. If you give due praise to Vaillant, posterity will be just to your memory.'

THE END.

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